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LESSON FROM THE CASH REGISTER CO.'S EXPERIENCE.

Some men spend thousands to learn a lesson; and the meanwhile the world profits from their expenditure. The experiment, which the National Cash Register Co. nurtured with so much care for so many years, was conceived in defiance, and perhaps in ignorance, of one of the fundamental traits of human nature. It was doomed to failure at its birth. A student of humanity could have foreseen inevitable disaster. The fact that it lived so long would not have shaken his belief, for the frailest structure will stand provided the wind does not blow. Not that their structure was poorly fashioned, for they builded well; but not wisely. Workmen don't want palliatives; they want pay. Many complex things come out of the earth, but the most complex of all is the human mind. Pie for one man is poison for another. Individuality is infinite. No man, or set of men, no factory or firm, can make one sweeping rule to govern the social instincts of their employees. Even music, universal as is its language, falls occasionally upon a deaf ear. Grant knew two tunes—one was Yankee Doodle and the other wasn't. The National Cash Register Co. could have played symphonies and sonatas to him forever and he would have been none the wiser. He could not have returned a farthing's appreciation. This is merely illustrative. Men are not like peas in a pod. They fairly bristle with differences. If they didn't the world would perish of ennui. Men do not want that which is given to them. This is so self-evident that it has the force of an axiom. Gifts lead not to friendship but to contempt, and as sympathy is the sweet sister of love, so is contempt the dark brother of enmity and hatred. It does not matter that the spirit which inspires the gift is beautiful. The resentment may be veiled but it is certain. This trait in human nature may be mean but it exists and is true to life. It is the truth that managers of men should deal with. If they ignore it they are merely building upon the sands.

The National Cash Register Co. built a beautiful factory. It was clean, well ventilated and well lighted. So far so good. These three attributes advance the interests of the factory as much as they contribute to the well-being of the men. A workman, worth having, would appreciate that the employers were doing this as much for themselves as for him. In other words, they are not palliatives. It is only when the workman receives payment for his labor in a currency which he cannot divert to his individual taste that he grows restive. He does not want twenty minutes or half an hour off in the rest room, the library or the bath room. If the company is willing that he should have this time he would rather that it should be applied to shortening his hours of labor, for then the benefit is direct and tangible. To grant it to him during hours of labor is in effect to lengthen the day. Neither does he care for the lecture course or the cooking school. He knows that these things cost money, and he reasons that if he is entitled to them, he would rather have the money.

No system has as yet been found which will supplant a generous wage. It adds to a man's self respect and, in fact, it makes a man of him. If a company has money to expend to ameliorate the condition of its workmen let them put it directly into his day's wage. All other forms are idle.

GENERAL NAVAL BOARD IN SESSION.

The general board of the navy department has begun its sessions at the war college at Newport. The board has charge of the general questions of policy and of naval strategy and its assembling is in connection with the strategic problems before the naval war college. This year the problems are of more than usual interest and they will get a practical application by the presence of ships of the North Atlantic squadron. The problems involved relate to the approach of a foreign squadron and its efforts to gain admission to one of the large harbors along the coast. Aside from the strategy, it is said that there will be much practical advantage in determining with what accuracy the passage of a fleet of naval ships in the dark can be detected. This has been an issue during recent British naval maneuvers, when one large fleet was able to pass another within three miles and entirely avoid detection.

The members of the board are Admiral George Dewey, president; Rear Admiral A. S. Crowinshield, chief of the bureau of navigation; Rear Admiral Robley D. Evans, president of the board of inspection and survey; Rear Admiral Henry C. Taylor, formerly president of the naval war college; Capt. Charles D. Sigsbee, chief intelligence officer; Capt. French E. Chadwick, president of the naval war college; Commander Robert W. Milligan of the naval intelligence office; Commander Raymond P. Rodgers, a member of the admiral's staff; Lieut. Henry H. Ward, now inspector of the construction of the torpedo boat destroyers Lawrence and MacDonough, and Capt. George C. Reid, United States marine corps.

The annual meeting of the stockholders of the American Ship Building Co. (consolidated ship yards of the great lakes), for the election of directors and for the transaction of such other business as may be presented at the meeting, will be held at the office of the company, No. 15 Exchange Place, Jersey City, N. J., on Wednesday, July 24, at 11 A. M. For the purposes of this meeting, the stock transfer books will be closed at 3 P. M. July 3, and will open at 10 A. M. July 25.

DESIGN FOR NAVAL MEDALS ADOPTED.

Secretary Long has approved the designs for the West Indian naval campaign medal and the meritorious service medal of the war with Spain. The medals were submitted by a board consisting of Assistant Secretary Hackett, Rear Admirals Luce, Benham and Watson, and Col. Reid of the marine corps. The West Indian medal as approved contains on the obverse a profile of Admiral Sampson, surrounded by a wreath of oak leaves, and has the inscription in plain lettering "United States Naval Campaign in the West Indies, 1898. William Thomas Sampson, commander-in-chief. On the reverse is a representation of "the man behind the gun." It shows the deck of a naval vessel, and a group, consisting of a seaman stripped to the waist, a young naval officer and a marine in his shirt sleeves holding a rifle, all standing in the rear of a small calibre rapid-fire gun. In the background are the outlines of an armored vessel of conventional type partly concealed in the smoke of battle. Just below the group will be the inscription commemorating the principal battle in which the recipient participated. The designer gives the following example of the inscription: "Santiago, July 3, 1898. John Smith, Seaman, U. S. S. Texas."

The medal will be held to the pin bar by a crimson and blue ribbon, white being eliminated because it soils so quickly. For every other engagement in which a recipient of the medal participated there will be a bar containing the proper inscription. The meritorious medal consists of a wreath of laurel leaves holding a five-pointed star, each point being attached to the inner rim of the wreath and the space between the points being open. The star has an anchor in the centre, while the points bear the inscription "Navy of the United States in the War With Spain." At the bottom of the wreath are the words "Meritorious Service." The name of the recipient will be engraved on the reverse. The medal is attached to a broad crimson and blue ribbon, which forms a background for it.

It is believed by the navy department that the campaign medal will be satisfactory not only to the service at large, but even to those who have contended that the likeness of Rear Admiral Schley should have been included. The explanation that the medal does not commemorate only the naval battle of Santiago, but all the engagements of the West Indian naval campaign, has been accepted by some of Admiral Schley's friends who have made inquiries on the subject and have examined the law. All the medals will be of bronze. As approved by the secretary, the board's report provides that the West Indian medal shall be given to officers and men of the navy and the marine corps who participated in the following engagements: Cardenas, Cienfuegos, Santiago, the cable cutting at Guantanamo, the engagement of the Newark under Capt. Goodrich, and the cable cutting by the St. Louis off Santiago, and to officers and men who did not participate in the battle of Santiago, but who rescued men from the Spanish ships.

The meritorious service medal will be bestowed on officers and men who rendered such service in the West Indies other than in battle, including those who served on ships doing blockade duty who did not participate in any engagement. There will be no separate medal for such men as Naval Constructor Hobson and Lieut. Blue, who rendered conspicuous heroic services. Hobson, for his Merrimac exploit, will receive a meritorious service medal, and for such engagements as he was in while on the New York, the other medal bearing Admiral Sampson's likeness. The secretary of the navy will determine what constituted meritorious service other than in battle and to whom the meritorious service medals shall be awarded.

THAT SUPERPOSED TURRET QUESTION.

The naval board of construction is at present investigating the comparative weights of the 8-in., 7-in., and 6-in. guns. The information is desired to assist the board in its preparation of plans for two battleships and two armored cruisers to be presented to congress in December for its consideration. Several plans defining the character and disposition of the batteries are before the board. One of these calls for the most powerful main battery ever proposed for an American warship, embracing four 12-in. and six 8-in. guns. The design provides for two superposed turrets, one fore and the other aft, each containing two twelves and two eights, and six ordinary turrets, three to the broadside, each containing two eights. The superposed turret question is again being fought over, and despite the understanding that turrets of that character had been adopted by the navy as a permanent type, it is likely that the board will split in its conclusions on the subject. Whether the majority is for or against the further use of the superposed type has not been definitely determined. Two of the five members are said to be heartily in favor of superposed turrets for the new battleships. Whichever way the board decides the majority is not likely to be more than one vote.

The papers announce that an experiment which will "revolutionize the steel industry of America" is now about to be brought to a close at one of the Illinois Steel Co.'s blast furnaces at Chicago. The experiment is to show that Illinois coal, costing less than $1 a ton, can be effectively used in place of Connellsville coke, costing $5.14 a ton at Chicago. It is declared that the result "will mean the location of all steel mills in the country in and around Chicago." We wait with bated breath for further developments—not denying, however, the great advantage that would be derived from making coke of Illinois coal.

Commander William W. Kimball, of the United States navy, who commanded the Atlantic torpedo boat flotilla during the war with Spain, has written an article for Collier's Weekly upon the subject of "Modern Submarine Boats." The article is full of exact and valuable information.

MANEUVERS OF THE NORTH ATLANTIC SQUADRON.

Charlestown navy yard officers have been informed that the navy department is contemplating extensive maneuvers for the North Atlantic squadron this summer off the Massachusetts coast. Every summer for several years some fleet evolutions have been held, but never on such an extended scale as is now being planned. Two important features never before attempted will be undertaken by the squadron, and aside from these there will be important evolutions in squadron formation to test the maneuvering qualities of ships singly and in squadron formation. The establishment of an outlying base of supplies, and also the first trials with mines, are to be included in the program. Nantucket, Martha's Vineyard and other islands off the New England coast are under consideration as the scene of operations. Near one of these the entire squadron will undertake to simulate the work that might be required in time of war, when operating away from a base of supplies or in waters controlled by the enemy.

It is an accepted fact among naval strategists that no fleet is self-sustaining, and that for every battleship costing $5,000,000 it is necessary to have auxiliaries in the form of supply vessels, scouts and colliers, representing several times that sum, to support it while acting away from home waters. It is to determine the expedition, facility and readiness of the fleet to establish such a base of supplies on shore that the fleet will try this summer to provide a thoroughly-equipped base such as is required in war time. If there is any weakness in the system of handling guns, men and ammunition between the ships and the shore it will be discovered during this test. Precisely the same rules will apply as though the squadron was at war in some distant part of the world. Marines will be landed, the light guns taken ashore, ammunition and supplies landed, and a large quantity of coal, sufficient for the whole fleet, stored away. There will be the sham battles, the landing of men under cover of the ship's guns, their embarkation under the same conditions, and the protection of the approaches by submarine mines. Heretofore the mechanism of mines has not been sufficiently perfect to allow of their use. Orders directing the fleet to assemble at Newport will soon be issued by the navy department, and the general board will be in session at Newport at about the time the fleet commences its operations.

STEEL CORPORATION ABSORBS SHELBY STEEL TUBE CO.

The official announcement is made by J. P. Morgan & Co. that the Shelby Steel Tube Co. has been purchased by the United States Steel Corporation, thus removing the most formidable competitor of the National Tube Co. The Shelby company was incorporated in February, 1900, with an authorized capital of $15,000,000. Of this amount $5,000,000 preferred and $8,175,000 common has been issued. The preferred pays 7 per cent. dividends. The company embraces ten firms with a capacity of 100,000,000 ft. of steel tubing per vear. They are as follows: Shelby Steel Tube Co. of Pennsylvania; the Shelby Steel Tube Co. of Ohio (operating); the Pope Tube Co. of Hartford, Conn.; the Newcastle Tube Co. of Newcastle, Pa.; the Albany Manufacturing Co. of Albany, Ind.; the Auburn Bolt & Nut Works of Auburn, Pa.; the Ellwood works of Ellwood City, Pa.; the Greenville works of Greenville, Pa.; the American Weldless Tube Co. of Toledo, O.; and the Shelby works of Shelby, O. The directors of the company are: W. E. Miller, H. A. Lozier, Col. Pope, Charles T. Boynton, R. L. Coleman, Frank O. Lowden, James B. Dill, B. J. Williams, L. S. Hoyt, John L. McKinney and I. I. Carolan. No definite information has been received as to the price paid for the stock. The price is understood to be $50 for the preferred and $10 for the common, but not in cash.

PENNSYLVANIA RAILROAD BUYS CAMBRIA STEEL CO.

Judge E. H. Gary, chairman of the board of the United States Steel Corporation, says that the Pennsylvania Railroad Co. which recently acquired the Pennsylvania Steel Co. has also purchased the Cambria Steel Co. He said:

"President A. J. Cassatt of the Pennsylvania Railroad Co. voluntarily stated to me a few days ago that his people had purchased both the Cambria Steel Co. and the Pennsylvania Steel Co. and at the same time assured me that it would be the disposition of these companies to operate in entire harmony with the United States Steel Corporation. Basing my statement on previous business transactions with Mr. Cassatt, I am pleased to say his assurances are received with perfect confidence and entire satisfaction. None of the interests of any of the steel companies will be prejudiced by reason of these purchases."

The Cambria Steel Co. has a capital stock of $16,000,000, the par value of each share being $50. Only $13.50 a share has been paid up. The company was incorporated Nov. 14, 1898, and on Dec. 1 of that year leased the Cambria Iron Co. for 999 years at an annual guaranteed rental of 4 per cent. on the $8,468,000 capital stock of the latter corporation. In 1900 it paid regular quarterly dividends of 50 cents a share, besides an extra dividend of $4.50 a share in May.

RESTRICTING THE USE OF FIRE-PROOFED WOOD.

It would seem that reports from concerns engaged in fire-proofing wood, some of which have crept into these columns, are not altogether correct. The secretary of the navy last week approved a report of the board of construction recommending the discontinuance of fire-proof wood for decks and for all joiner work below protective decks, on vessels having protective decks, and on all vessels below the berth deck. Wood treated by the fire-proofing process will be used, however, in torpedo boats and torpedo boat destroyers and will be painted. In other ships metal will be used in place of wood, wherever possible. The recommendation of the board was based on reports received concerning the utility of fire-proof wood. A bonfire was made of fire-proof wood taken from the decks of the Helena at Manila. The surgeon of the Wisconsin complained that mould gathered on the fire-proof wood of his sick bay. The reports of Naval Constructor Baxter, who made tests at Boston, showed that the wood, when exposed to the weather for a week, loses 50 per cent. of its fire-proofing qualities and the fire-proofing process made wood brittle.

The Lidgerwood Manufacturing Co., New York, has a contract to equip the new battleship Illinois with the Miller apparatus for coaling at sea.

HISTORY OF HELEN MINE.

Dr. Robert Bell, acting director of the geological survey, gives the following interesting particulars in his report of the new Helen iron mine at Michipicoten, just above the Sault on the north shore of Lake Superior:

"The existence of iron ore at what is now the Helen mine is said to have been known for two or three years to certain trappers and explorers, one of whom, Benjamin Boyer, brought it to the notice of Mr. F. H. Clergue in 1899. The latter purchased the location and immediately proceeded to develop it as a mine. The occurrence lies at the east end of a deep pond, about a quarter of a mile long, called Boyer lake. The ore is a hard but somewhat porous or spongy red hematite, with a specific gravity of about five. The ore body, from which a layer of muck or peaty moss has been removed, forms a point dividing the head of the lake into two small bays. It has a lumpy surface with a dary blueish gray color. Small quantities of brown hematite (limonite) and yellow ochre appear in joints and cavities, but they do not form any appreciable portion of the mass. The horizontal dimensions of the exposed ore are about 500 ft. in every direction and its greatest height above the lake is 100 ft. The ground rises steeply all around the head of the lake, so that the ore lies at the bottom of the amphitheatre, open to the west or lake side. A drift has been run at the level of the general surface of the ore, southward into the hill, and this penetrates similar hematite for 250 ft., thus giving a known breadth of 750 ft. from north to south. During the winter of 1899-1900, by taking advantage of the ice on the lake, a number of holes were bored in the bottom along a north and south line, which passed the extremity of the point of the ore at a distance of 250 ft. to the westward. On this line and abreast of the point the lake had a depth of 100 ft., including 10 ft. of soft mud, and at 150 ft. below the bottom, where the boring ceased, the drill was still in hematite like that on the dry land. A borehole from the surface of the exposed ore was sunk to a depth of 188 ft. below the level of the lake without reaching the bottom of the hematite. The ore mass has thus been proven to have a continuous depth of 300 ft., and as this follows the plane of the bedding, which is vertical, the probability is that the depth is very much greater. The general strike is parallel to the axis of the pond, which is about east and west. The railway approaches the mine from the west along the foot of the hill on the south side of the lake."

ANOTHER CANADIAN SHIP YARD STORY.

A Montreal dispatch says: "A very important piece of news comes from Boston concerning the ship building enterprise and the Canadian fast steamship line as well. It is stated that Mr. H. M. Whitney has carefully made up his mind that the harbor of Sydney is far superior to all other maritime ports for a ship building plant, and that consequently everything tends to the selection of the Cape Breton port. Mr. Whitney argues that all eyes are turned toward Sydney, which has not only a national but a world-wide reputation for steel products, and that American and European capital will accept as a natural consequence the establishing of an extensive ship yard at Sydney, not only to turn out steel ships for freight purposes, but the best and fleetest of ocean greyhounds. Mr. Whitney's intentions, according to the latest reports, are likewise pretty well defined with regard to the much discussed fast line between the shores of Britain and Canada. It is stated that Mr. Whitney and his associates have already been awarded a provisional contract for the building of three large passenger steamers, either one of which will be able to make the trip between Southampton and Sydney in four days, and it is likewise claimed that the boilers and heavy machinery as well as the hulls can be made at Sydney. It is reported, in fact, that the president of the Dominion Iron & Steel Co. has the entire plan of rapid ocean transit carefully mapped out in every possible detail, and that Sydney will be the base of these operations. In a word, Mr. Whitney claims, that with new ships and a rapid train service, he can land European passengers in Chicago by the time the fastest boats on the old route will reach New York."

CRAMP-VICKERS-BETHLEHEM COMBINATION.

The latest report is that the Vickers Sons & Maxim Co., the Wm. Cramp Ship & Engine Building Co., and the Bethlehem Steel Co. are to be merged into one corporation. It is announced this time as a certainty. President Cramp admits its truth but says that the details are yet to be arranged. This is the first time Mr. Cramp has admitted the truth of the rumor regarding the consolidation. Charles M. Schwab, who recently purchased a controlling interest in the Bethlehem stock, will turn it over to Kuhn, Loeb & Co. of New York, who have been after it in the interests of a Vickers-Cramp combination. This disposition of the stock was advised by J. Pierpont Morgan, who was consulted in the matter. Though selling control, Mr. Schwab will remain as a large stockholder in the new company. While the United States Steel Corporation desired to maintain friendly relations with the Bethlehem company, it was held to be undesirable for either the corporation or its president, Mr. Schwab, to retain the ownership. The Vickers-Maxim company is already arranging for an extension of its capital stock in connection with the deal. In the transaction the price of $24 per share for Bethlehem is maintained. For more than a year the Vickers Sons & Maxim Co. has been endeavoring to obtain a foothold in the American field. First a combination with the Cramp interests was proposed, and later the formation of a corporation to take in both the Midvale Steel Works and the Cramps. These negotiations fell through when they seemed to be in a favorable stage and the attention of the promoters was turned to Bethlehem Steel.

The annual meeting of the Bethlehem company was held in Philadelphia last week. The report for the year ended April 20 showed a net income of $1,082,492; charges $701,088; balance $381,404; dividend $600,000; deficit $218,596; previous surplus $3,463,726; total surplus $3,245,131. The old directors were re-elected. The announcement of a sale of 160,000 shares to Charles M. Schwab was made. It was also announced that the sale of the remainder to him was open to the minority upon the same terms.

Unless the strike of machinists causes unexpected delays in the ship building industry, the large Pacific mail liner, Siberia, under construction at the works of the Newport News Ship Building & Dry Dock Co., will be launched shortly, but there is still considerable work to be done on the sistership Korea before she reaches the launching stage.

LORD BRASSEY DISCUSSES AMER CAN NAVAL TYPES.

The naval annual by Lord Brassey has just been issued in England. The annual is a most thorough review and according to the comments made upon it in the English press has attracted great attention. Considerable space has been devoted to the United States navy. Discussing the United States vessels represented Engineering of London says:

"The plate of the United States battleship Georgia presents a truly astounding picture of this remarkable class of 15,000-ton war vessels. She literally bristles with guns, and her unarmored portion is insignificant. A broad belt of Krupp-treated steel, varying from 11 in. to 8 in. in thickness by about 10 ft. in depth, covers the vitals at the water-line. This thins off to 6 in., 5 in., and 4 in. at the ends. From the armored belt rises a citadel for nearly two-thirds the length of the ship, covered with 6-in. Krupp steel, and extending to the upper deck. Soaring aloft from this again are the superposed turrets, 9 in. and 6½ in. thick, and resting upon 10-in. barbettes. It would appear that the center of gravity of this battleship must be uncommonly high, unless the preponderating weight of so immense a mass of armor, reaching up to the upper deck, is balanced by heavy weights below. It is said that the magazines will contain sixty rounds for each 12-in. gun, 125 for each 8-in., 200 for each 6-in., 250 for each 14-pounder, and 500 for each 3-pounder. All of this ammunition would, of course, be very low down in the ship; but it is generally understood that only 50 per cent. of American warships' ammunition is carried at normal displacement. It is therefore difficult to see how stability has been secured, although the immense beam of 76 ft. 3 in. would necessarily create better metacentric height. Assuming the mean draught of this vessel to be 26½ ft.—the actual figure not being given in the annual—the coefficient of fineness would be 0.59, which would give her a very sharp under-water contour. A significant comparison between her armament and that of our Duncan class is given in this work, the comparison being unfavorable to the latter. It would, however, be fairer, we think, to place the Georgia alongside of the British battleship Queen. The result would be as follows:

	Georgia.	Queen.
Displacement	15,000 tons	15,000 tons.
Speed	19 knots	19 knots.
Armament	Four 12-in	Four 12-in.
	Eight 8-in	Eight 7.5-in.
	Twelve 6-in	Ten 6-in.
	Twelve 14-pounder	Sixteen 12-pounder.
	Twelve 3-pounder	Six 3-pounder.

"It will be at once seen that these two classes of battleships, both being as yet, so far as completion is concerned, in nubibus, are, as regards the features of displacement, speed, and armament, almost identical. Their armored protection can hardly be compared, as no plate is given of the Queen. The United States armored cruiser California makes a striking looking picture. In place of the short armored belt and isolated dotted-about armored casemates of the Brooklyn, she has a complete belt of Harveyed steel about 7 ft. 6 in. deep from stem to stern, 6 in. and 5 in. thick in the middle, and thinning out forward and aft. A sheathing of 5-in. armor rises from this armored belt to the boat deck over all the vitals of the ship, whilst the 8-in. breech-loading guns have hoods of 6-in. armor. Thus the whole of the upper deck quick-firing guns, as well as those of the main deck, with the exception of a few forward and aft, are embraced within an armored battery of 5-in. Harveyed steel, a condition which does not exist even in our armored cruiser Drake of 14,100 tons, where the men serving the 12-pounder quick-firing guns on the upper deck would have absolutely no protection at all. In this respect, although the depth of armor forward on the Drake is greater than that of the California, we cannot help feeling that the United States vessel would afford better security to her crew in action than the British cruiser of practically similar size and almost equivalent speed. A most important plate must not be forgotten. It is that of the submarine torpedo boat, six of which are being constructed for the United States. With its gas engines, storage batteries, huge air flasks, gasoline tanks, compensation tanks for filling after the expulsion of torpedoes and other special appliances, there appears little room for accommodation of officers and crew. Probably, however, the number of these will be reduced to the lowest possible limits. The drawing, which singularly resembles that of a well-proportioned trout, gives many details and is instructive.

"Chapter I, by Lord Brassey, notices the enormous advance in naval expenditure under all the leading administrations. France is spending £13,500,000 upon her navy; Russia, £9,000,000; Great Britain, this year, £30,875,500, being an increase of nearly £12,000,000 upon that of the year 1894-95. But it is remarked that 'the fleet is England's right arm.' Every shilling devoted to it, if expended with economy and judgment, is well bestowed, for it is England's insurance against those great accidental calamities which destroy the prosperity, and sometimes the lives of nations. It is the only fighting arm in which, by the nature of things, we have the chance of surpassing all other peoples. It is the form of war most suited to the genius of our race, and bound up with the most stirring traditions of our history. In all campaigns for the past seventy years naval forces have materially influenced, and have often decided, the result. Accepting as our standard equality to any two powers British expenditure cannot be considered inadequate. There are some who insist that our fleet should be superior to a combination of France, Russia and Germany. But the maintenance of such a force would impose a heavy burden. It should not be necessary whilst prudent counsels prevail in the direction of the policy of the empire. There are reasons, however, for maintaining our fleet at the full standard of equality suggested which did not exist at the time of Nelson. Blockade in these times must be an arduous science, as steam has made it possible to put to sea in all weathers; and the necessity for keeping reliefs for over-taxed crews, and supplies of coal for blockading vessels, is a far greater difficulty than those met with heretofore. We hardly agree with Lord Brassey, however, in his estimate of the value of 'mercantile auxiliaries as the scouting ships of our squadrons, and the defenders of our commerce.' On the contrary, we cannot but think that a very fast cruiser of large coal-carrying capacity, such as that proposed by Admiral Sir P. Fitzgerald, would be much more useful as a scout, and a fast armored cruiser, such as the California, would be much more useful for the protection of commerce than a dozen liners from the mercantile marine."

MR. STEVENSON TAYLOR ON THE ERIE-TASHMOO RACE

Mr. Stevenson Taylor, of the W. & A. Fletcher Co., which built the compound beam engines of the steamer City of Erie, is quoted as follows regarding the performance of their engines as against the inclined triple expansion engines of the Tashmoo:

"An engineer looks upon an engine with reference to the work it has to do. There is the Tashmoo with a displacement of say 1,350 tons, very nearly—that is the weight of the water she displaces when she is put into the river. There is the Erie with a displacement of twice that amount, say 2,700 tons. The problem for the engineer is to move this bulk through the water at a required speed and he puts in an engine competent for the work. To get the required speed and service out of the Tashmoo it was necessary to build for her a triple-expansion engine that would normally develop 2,500 H. P. To move the larger bulk of the Erie with compound engine it was necessary to have one that would develop normally 3,600 H. P. I speak of the normal horse power of the engine, meaning the power the engine is expected to develop under ordinary circumstances in the running of the boat. Now a peculiar thing about compound engines is that this point of greatest efficiency is attained when the cylinder is cut off, that the steam follows the stroke about half the distance. In triple expansion engines this point is quite different, the best economy being obtained by permitting the steam to follow the stroke from 75 to 80 per cent. of the distance. As a result of these facts a compound engine can ordinarily, when in perfect condition, be made to develop nearly double its normal horse power, while the triple expansion engine can add only about one-fifth to its normal.

"The Erie during the great race actually obtained from her engines, which are normal at 3,600 H. P., the great total of 6,800 H. P., or 190 per cent. of normal. The Tashmoo actually developed in the race 3,200 H. P., her normal being 2,500, or 128 per cent. of normal. This was a surprising performance for the Tashmoo's engine, about 8 per cent. better than might have been expected. It was a great performance for the engine on the Erie also. There being twice the displacement in the case of the Erie, it should have taken twice the horse power to have made her equal to the Tashmoo in speed, other things being equal. The Erie needed 6,400 H. P. to make her equal to the Tashmoo with 3,200. These figures show that the Erie had 400 H. P. to her advantage to balance the finer lines of the hull, reducing the resistance of the water, on the part of the Tashmoo, and the smaller percentage of slip on the part of the Detroit steamer's engines. The slip is the loss of power in the engine—power put in that does not reappear in forward motion in the boat. For the Tashmoo the slip figured out 30 per cent. during the race, and for the Erie 32 per cent."

CANADA'S INDUSTRIAL DEVELOPMENT.

Commercial Intelligence, of London, Eng., has for some time past had a special commissioner in Canada investigating the industrial advancement of the colony. His reports are quite interesting. Following is an extract:

"At Sydney, C. B., a locality which bids fair to rival in fame the Sydney that lies beneath the Southern Cross, an American, Mr. Whitney, is devoting his energies, with profit to Canadian industry and no less gain to himself, to the development of the rich mineral resources of Nova Scotia and Newfoundland. On the Canadian shores of Lake Superior it is again an American, Mr. Clergue, who is the head and front of the new iron and steel developments. In both cases these American industrial pioneers have been remarkably successful in gaining the ear of Canadian governments. The benefits bestowed on the Dominion Coal Co. and the Dominion Iron & Steel Co., of Mr. Whitney, are paralleled in Ontario by the extraordinary favors granted to the newly-formed Clergue Iron & Nickel Steel Co., of Mr. Clergue. In April the Canadian Dominion legislature learned with a gasp that the minister of railways had made a bargain with Mr. Clergue for the supply of 25,000 tons of steel rails per annum for Canadian government lines for a period of five years. Such proceedings are enough to make old-fashioned political economists stare. Some staunch free traders have been known to condone protection in a young community because of its assistance in establishing new industries which, when strong enough to walk alone, could be left to flourish unprotected. But the assistance given by modern 'young communities' goes much further. Bounties are paid with a lavish hand and business guaranteed to concerns which have not yet an existence, save in the brains of a financier. The Clergue contract was not swallowed by the Dominion parliament, however, with an easy grace. Long debates of an angry and personal character were waged over its conditions, but the contract remains, and Mr. Clergue has triumphed."

Speaking of the fiscal and industrial policies of the two political parties in Canada the correspondent says:

"Our readers will gather from these special articles that it is now next to impossible to discover any difference between Canadian liberals and Canadian conservatives on the question of the artificial fostering of Canadian industries, and it may be added that, after the speeches of members of the Laurier government on the Clergue contract, that Canadian liberals can no longer pretend to pose, as they did when out of office, as opponents of a high protective tariff and of bounties. The two parties still differ as to preferential trade with Great Britain. The conservatives contend that we in the Old Country should have been pressed for some equivalent before the preferential tariff was arranged in 1897, and subsequently increased from 25 per cent. to 33 1-3 per cent. But both Canadian political parties are now upholders of protection, and of liberal bounties in aid of industry, and the Laurier government has indeed gone a step beyond the conservatives themselves by initiating a new method of fostering new Canadian industrial enterprises."

Declaring that British industrial circles must recognize the fact that Canada is to be reckoned with hereafter in the iron and steel world, he adds: "The natural advantages which the United States possesses in waging war with our iron and steel industry are not greater than those of Canada, while the Dominion has instituted a policy of export bounties on iron and steel, to say nothing of other forms of government assistance, which place the Canadian manufacturer on even a better footing than his confrere across the political boundary line. In Canada we have to face, in short, the enterprise and skill of Americans, the richest and cheapest mineral resources available in the world at the moment, combined with government assistance in the form of a bounty on every ton of iron or steel landed on our shores. What do our manufacturers say to the prospect?"

CONSTRUCTION OF TORPEDO BOATS AND DESTROYERS.

BY GEORGE HERBERT WILSON.

SHAFT HANGERS.

In the last of this series of articles the propeller struts were carefully outlined and the best type of a strut was pointed out. It is my purpose in this article to follow along the same line and deal with the shaft hanger. The shaft hanger or bearing must fulfill the functions of its name, and besides acting as a hanger and bearing it must also prevent the shaft from vibrating, as such a long, unsupported length of shaft is apt to do. It is this latter function with which this article will have principally to deal. The question of the best location for a bearing on the shaft having been decided, the matter of providing a bearing is very simple and the general practice of shaft bearing can be followed. The strength of this hanger is of course decided upon by the size and weight of shaft and its resistance to vibration by the unsupported length. This length varies from about 16 ft. in the smaller boats to 25 or 30 ft. in the larger ones. In some of the larger boats, however, this length is not in excess of that of the smaller craft. In the boats I have selected for a comparison along this line the unsupported lengths were 30 ft. and 44 ft. respectively

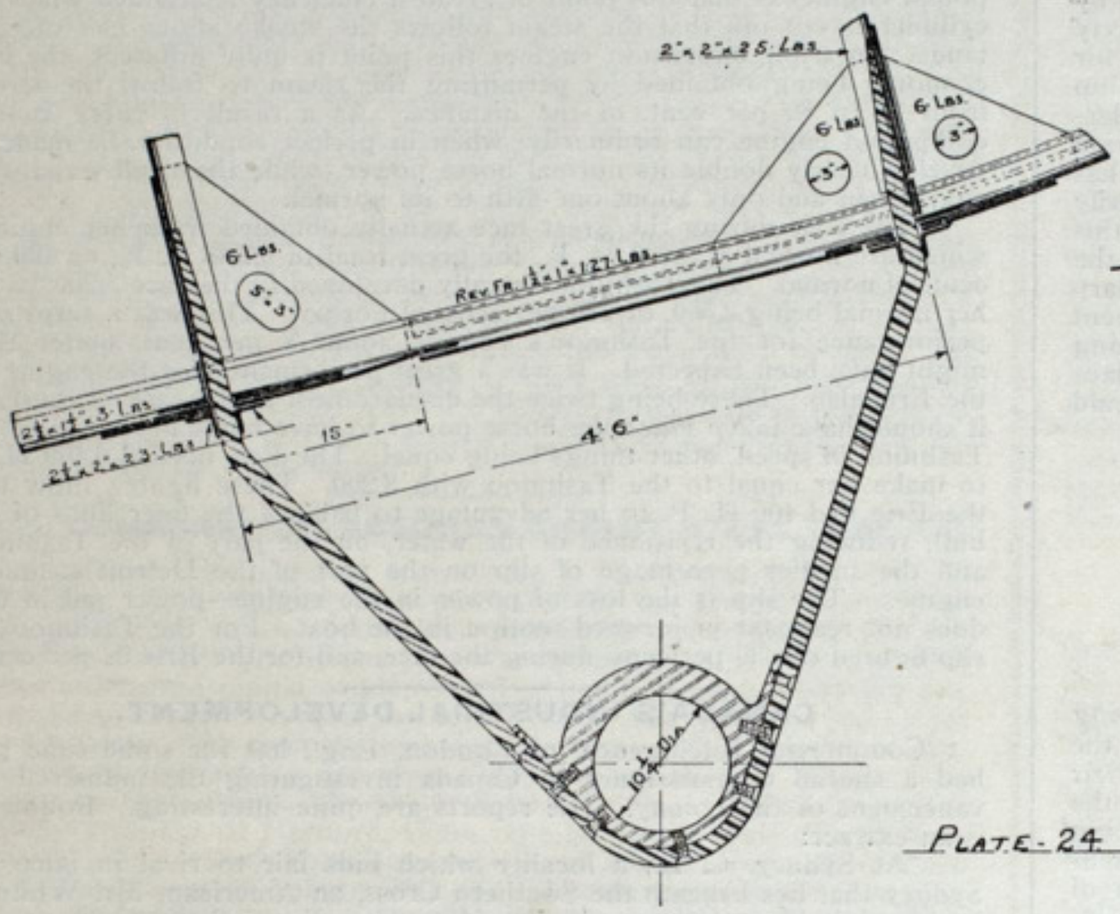
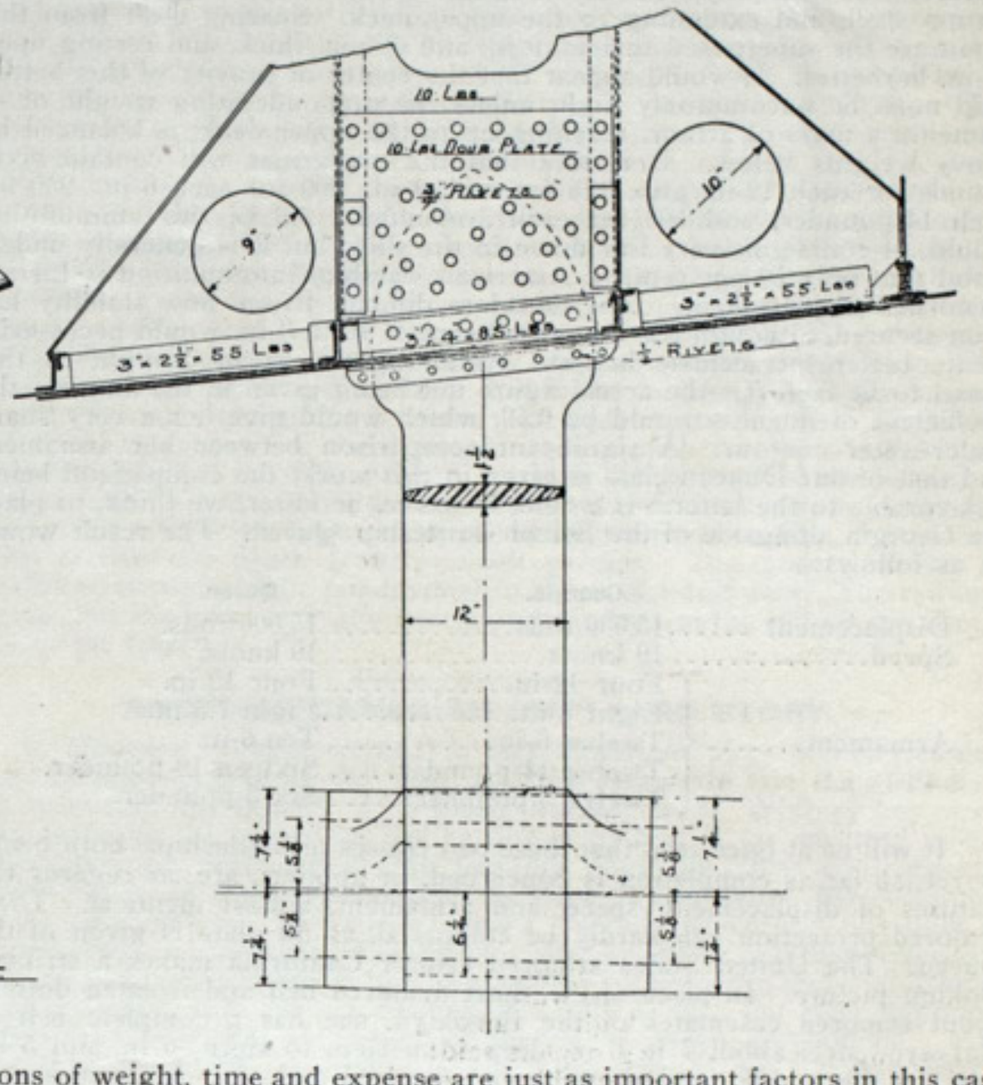


PLATE-24



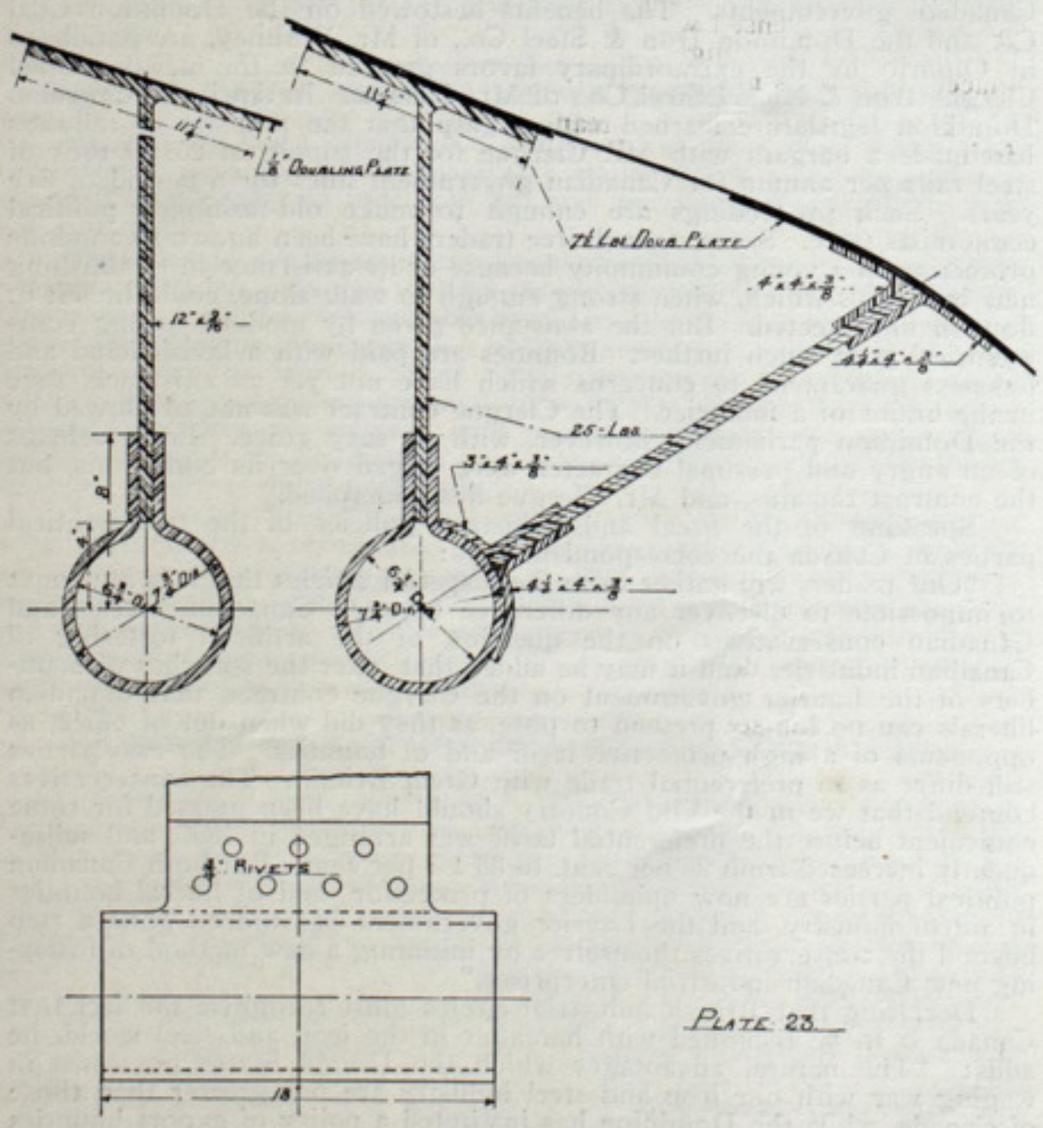


PLATE 23.

In a general outline regarding the proper construction to adopt, the best materials to employ and the effectiveness of the various types in use, the same arguments as were promulgated in the previous article on shaft struts will follow in this instance.

Putting aside the question of construction for the present, I will deal with the best materials to employ in such construcion. It must be remembered that although the functions of the shaft hanger are of vast importance—in prohibiting any local vibration, yet it cannot be considered of enough import to warrant an expensive outlay of material and labor in its construction. For that reason I can see no advantage in installing a forged strut or even a cast steel one when a much simpler affair can be built up of different materials. The same argument against forged and cast steel struts that was used in my previous article will hold good in this case, with the additional fact of their being less necessary. The questions of weight, time and expense are just as important factors in this case as in the other. As regards weight, however, there is not as much room for saving as there is in the propeller struts, as the shortness of the arms prohibit it. But the other items are of enough importance to warrant considerable thought and time in their design.

The matter of design for this fitting should involve close attention and ample consideration. There was a tendency to regard this detail of the shaft arrangement as of minor importance, but after considerable experience along these lines, in which numerous accidents have played an important part, it has been restored to its proper place among the more important features of hull construction.

In the designs of some of the earlier boats the shaft hangers were constructed with a single vertical arm attached to hull and merely carrying the weight of the shaft, the question of vibration being uncared for except in the vertical line. This was, of course, an oversight, and, after one or two accidents, in which the vertical arm was broken off short at the hull, the defect was remedied by an auxiliary side arm extending from the hub to the shell plating. With this knowledge and experience at hand it seems strange that in the designs of some of the later boats the same defect was present and was not remedied until some time after the boats were under way. A recurrence of this error is not likely, and at the present time the construction followed is of a different character.

The method of construction followed later on was a two-armed strut, the arms being at an angle of about 75 or 80° apart. In some cases they were made of cast steel and in others of a forging. Another type of strut is made of a cast steel hub and a heavy plate bent around it and carried up to form the two arms, the angle being about the same. In these various constructions the effect is gained in all and they have all been found to work satisfactorily. It must be remembered that the vertical-arm strut, being more or less of a makeshift, can hardly be counted as satisfactory. It remains therefore to select from these types, all being more or less efficient, the best construction to follow. In the matter of construction the cast and forged struts are simple enough, but the expense and "time clause" give to the built-up hanger the advantage.

Departing from these general considerations, I will outline two of these types as shown in the accompanying plates. The design of a hanger of the forged or cast type is a simple matter and will not necessarily be discussed here. In plate No. 23 is shown the vertical-arm type of hanger employed in the earlier boats. The two sectional views show the hanger as at first constructed, with the point of rupture shown, and the hanger newly constructed after the accident.

Upon dry docking this boat the hanger was found hanging on the shaft, the position of the arm being reversed. The break, as shown, occurred close up to the palm attached to the shell plating and every indication pointed to the vibration of the shaft in a horizontal plane as the direct cause. It can be readily seen that if the unsupported hub of the hanger attains any vibratory motion it must necessarily be in a lateral plane. The weight of this motion, multiplied by the length of the hanger arm, produces a considerable moment of vibration. It remained therefore for the vertical arm to resist this strain, which it was not capable of doing. In the sectional view showing the repaired hanger the slanting arm attached to the hub and to the shell plating resists this motion and forms a very rigid support and stay for the shaft at that point. The vertical arm

was made of a plate welded to the palm plate. The hub was a plate bent around a mandril and riveted to the vertical plate. Inside of this hub plate the castings for the bearings were fitted. The extra arm was tapped to the hub plate and the palm was riveted to the shell plating. In the wake of the palms doubling plates were fitted and the floor plates were made extra heavy, with fore and aft brackets, lending additional stiffness. The palm in this case did not extend but about one-third of a frame space each side of a frame.

When the hanger was repaired, large double angles supplanted the palm of the broken hanger and gave a more rigid connection, by reason of the two additional vertical flanges of the angles. The extra arm was made of a flat plate flanged at both ends to form the palms to connect to the hull and to the hub of the hanger.

In the type of hanger just described the length of unsupported shaft was 30 ft. In the other method employed the length of shaft was 44 ft. The construction in this case is also of the "built-up" order, but the detail is entirely different, although the general effect is the same. In the building up of this hanger a cast steel hub is employed, around which is worked the single plate forming the arms. This hub or bearing is carried up to form the stumps of the arms through which this plate is riveted. This plate is also tapped into the main part of the hub. This plate is worked in the smith shop over a templet, and the ends are hammered and cut out to form the palms.

Differing from the other construction, the arms pierce the shell plating and have a much better arrangement for local stiffness than has the other type. In this case a special longitudinal is worked, connected to a main longitudinal at the forward end. The requisite strength of the main connection is brought up by a sufficient number of rivets through the palms and intercostal plates. The water tightness is effected by angle-collars fitted snugly around the arm plate where it pierces the hull. The rounding off of all sharp edges and corners by filing decreases the resistance and makes a much neater looking job.

It is obvious that the fault in the construction previously described is not found in this one and the resistance to vibration is well cared for. This type is of far better design than a great many of the earlier ones and also of some of the present. The construction is easy and the installation is a very simple matter. The usual doubling plates, heavier floors, extra stiffness, etc., as is used in the propeller struts, except for a proportionate decrease in the scantlings, follows in this case.

BATTLESHIP MASSACHUSETTS NAVIGATES HELL GATE.

One day last week Capt. Manney took the battleship Massachusetts through Hell Gate. The next day the navy department issued instructions that no naval officer should again attempt to navigate Hell Gate with a battleship except under specific instructions or under great emergency. This was construed in some quarters as a rebuke of Manney's intrepid performance, but it was not so intended. Secretary Long has commended Capt. Manney for the way in which he performed the dangerous piece of navigation. One of the highest ranking officers in the naval service in discussing Capt. Manney's exploit said:

"It was one of the finest things ever done by a naval officer in time of peace—in fact the very finest thing that I can recall. It was a magnificent act of daring and professional skill, the most conspicuous of the kind in the recent history of the navy. Manney has demonstrated that a battleship can get through Hell Gate. That was something that needed demonstration. When he did that Manney took his commission in his hands. Had he failed he should have lost his commission. But he did not fail, and his reward should be all the greater for the risk he ran. He should be commended officially in the highest terms. Manney was a new man on the Massachusetts. He had never handled her before except in the short and easy run from Tompkinsville to the New York yard. But he was not afraid to handle the ship. Such men as he win victories for the nation. The navy wants officers who know when to take chances and Manney is one of that kind. Now let me show why he performed a feat that will prove of value to the navy. It is necessary to pass through Hell Gate to get to New York's line of defence. In time of war with a foreign fleet off New York it might be extremely dangerous to have vessels take the outside route to get into Long Island sound. To pass into that body of water without endangering the American ships it would be necessary to go through Hell Gate. Gull island and Fisher's island, with between them that tide rip passage known as 'The Race,' mark the eastern line of New York's defences. Fisher's island has been fortified, and to support its batteries a squadron from New York must make the Hell Gate passage. So you see how important it was for somebody to demonstrate that the thing could be done safely by the largest vessels. Manney has given the demonstration. He will never be forgotten in the naval service for that courageous act. On his own ship he will have the loyal support of every officer and enlisted man. In the fo'castle they call the captain 'old man,' and I tell you that on the Massachusetts and whatever other ship Manney may command, nothing the 'old man' wants done will be too hard to do."

On Monday morning last an unsuccessful attempt was made to raise the transport Ingalls, which was partially wrecked in the Erie basin dry dock in Brooklyn on June 14. She was lifted by the powerful derricks until her lower rail was above the surface and then slipped off the keel blocks and sank again a distance of about 4 ft. No one was injured by the mishap and the only damage was the breaking of the suction hose of the 10-in. and 8-in. pumps. The divers, after examining the vessel, reported that she had sustained no further damage through the mishap. It is expected that she will be successfully floated within a day or two. Suits aggregating $75,000 have been filed in the United States district court in Brooklyn by Lawyer B. H. Lord against the New York Dry Dock & Repair Co. for injuries sustained to thirty workmen on June 14 by the tipping over of the Ingalls, due to the negligence, as alleged, of the defendants in not having the vessel properly shored up in dry dock.

Some lake vessel owners see in present freight conditions a repetition of the fall boom of 1899.

AROUND THE GREAT LAKES.

Mr. M. A. Bradley, well-known vessel owner of Cleveland, who has been seriously ill, has so far recovered that it is expected that he will be at his office with the close of the present week.

Another new steel steamer from the works of the Jenks Ship Building Co. at Port Huron will be in commission shortly. It is expected that the steamer Charles F. Neff, owned by Samuel Neff and others, of Milwaukee, will leave the Port Huron yard on Saturday of this week for Washburn, where she will load a cargo of lumber. The new steamer will carry between 1,200,000 and 1,300,000 ft.

Capt. William S. Hoag of the steamer James B. Neilson reports that the sunken wreck of the schooner Charles Foster, which foundered off Erie Harbor in December, 1900, is a dangerous obstruction to vessels. The wreck is about nine miles N. 82° W. true (W. by N. mag.) from Presque Isle light station, and one of its masts projects 5 ft. above the water at an angle of 45°.

Citizens of Cleveland are arranging to present a silver service to the cruiser Cleveland, which is to be launched at the Bath Iron Works, Bath, Me., in August. A committee of citizens, consisting of ex-Mayor George W. Gardner, Lt. Com. W. E. Wirt of the naval reserve, Capt. C. E. Benham and Mr. T. F. Newman, have consulted with Mayor Tom L. Johnson regarding the matter.

Preparations are being made at the Wyandotte yard of the Detroit Ship Building Co. for putting down the keel of one of the two very large side-wheel passenger steamers that are to be built for service between Detroit and Buffalo. Parts of the machinery for both vessels are under way and it is expected that the hulls will be launched late in the fall so as to admit of a full winter's work on the cabins. These ships are to be ready for service about May 1 of next year and are to cost about $650,000 each.

Mr. W. J. Wood, naval architect of Chicago, who is engaged on designs for the new Milwaukee fire boat and who is to superintend construction of the vessel, submitted preliminary plans to Milwaukee city officials a few days ago. According to the present understanding, the vessel is to be 118 ft. over all, 107 ft. between perpendiculars, 25 ft. 6 in. extreme breadth, 24 ft. beam, 13 ft. 6 in. molded depth and 12 ft. 9 in. depth of hold. The boat is to have pumps that will throw 10,000 gallons of water per minute. Deluge is a name suggested for the vessel on the plans.

Barry Bros. of Chicago are negotiating with M. A. Bradley and others of Cleveland, owners of the wooden freight and passenger steamers Badger State and Empire State, for the purchase of the vessels. If a sale is effected the steamers will be taken from Lorain, where they are in idleness, to Lake Michigan, there to be operated by the Barry Bros. in connection with other freight and passenger vessels trading out of Chicago. These two steamers were remodeled some time ago and tried in Cleveland-St. Lawrence river service, but the venture was not successful.

One of the large freight steamers building at Buffalo, the Western line boat, is to be equipped with the type of hatch fastener patented some time ago by Capt. M. Mulholland of the steamer Alva. On the steamer Onoko all eight hatches fitted with this device were battened down in 40 minutes recently, the time including that required to take the tarpaulins from between decks. In an improved form of this hatch fastener the long set-screw is dispensed with by the use of a wedge that works on a hinge. By the use of the hinge there is no possibility of the wedge being misplaced, as it is as much a part of the fastener as the main casting..

It is expected that the steamer Frank H. Peavey, first of four large freighters building for the Peavey Steamship Co. of Duluth (two at the Lorain works and two at the Chicago works of the American Ship Building Co.), will go into commission next week. These are lake freighters of the largest type, fitted with quadruple expansion engines and Babcock & Wilcox water tube boilers, and will be managed by Mr. A. B. Wolvin of Duluth. The first ship, the Frank H. Peavey, will have elegant passenger accommodations in a separate house on deck, similar to the accommodations of the steamer John W. Gates, but the quarters on the other three vessels will be of the ordinary kind. There is still considerable work to be done on the Geo. H. Peavey, second vessel at the Lorain yard, as she was launched only yesterday.

CRAMP ONTARIO STEEL CO.

At a meeting of the directors of the Cramp Ontario Steel Co. in Toronto, C. D. Cramp, president, stated that the company is completing arrangements for letting a contract for the plant that is to be located in the Owen Sound district and expects to begin work soon. One result of the meeting was the decision to complete the purchase of 10,000 acres of coking coal lands in Wise county, West Virginia. Mr. Cramp said that the company has secured several iron properties in northern Ontario, on one of which he says there is 100,000 tons of bessemer ore in sight, and another area has a showing of iron extending over 300 ft. by 1,200 ft. It was announced that F. H. Clergue of Sault Ste. Marie considers that some of the conditions under which he associated himself with this company have not been fulfilled, and as a consequence his seat will be filled by a man practically associated with the iron and steel industry of the United States.

Delaunay Belleville & Co., French boiler manufacturers, inform the Review that they recently received from the Austrian government an order for sixteen Belleville boilers, supplied with economizers, for the ironclad Arpad of 11,900 H.P., and from the French government for twenty-eight boilers, also supplied with economizers, for the Victor Hugo of 27,500 H.P.

HYDRAULIC RIVETERS IN BRITISH SHIP YARDS.

A series of articles on "The Mechanical Equipment of a Ship Yard," now being published in the Engineering Magazine of New York, is especially interesting on account of the great variety of tools that are illustrated. The articles are by Prof. J. H. Biles of Glasgow University, who

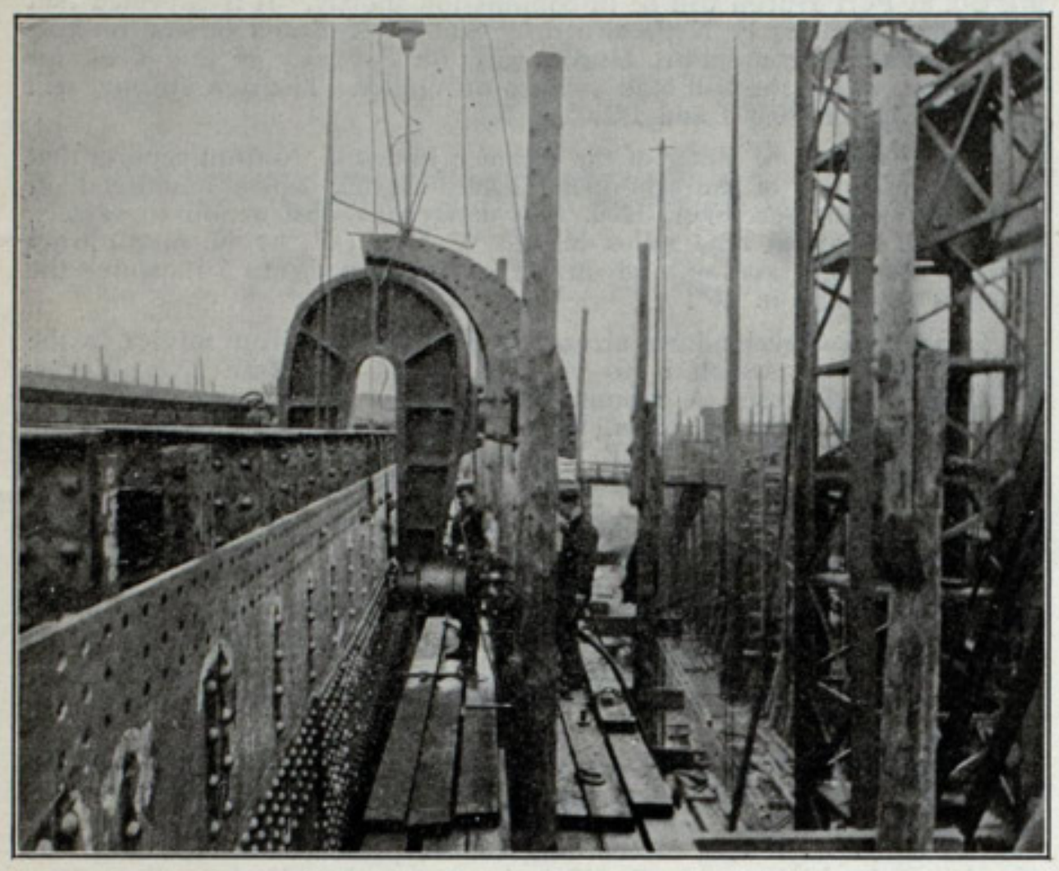
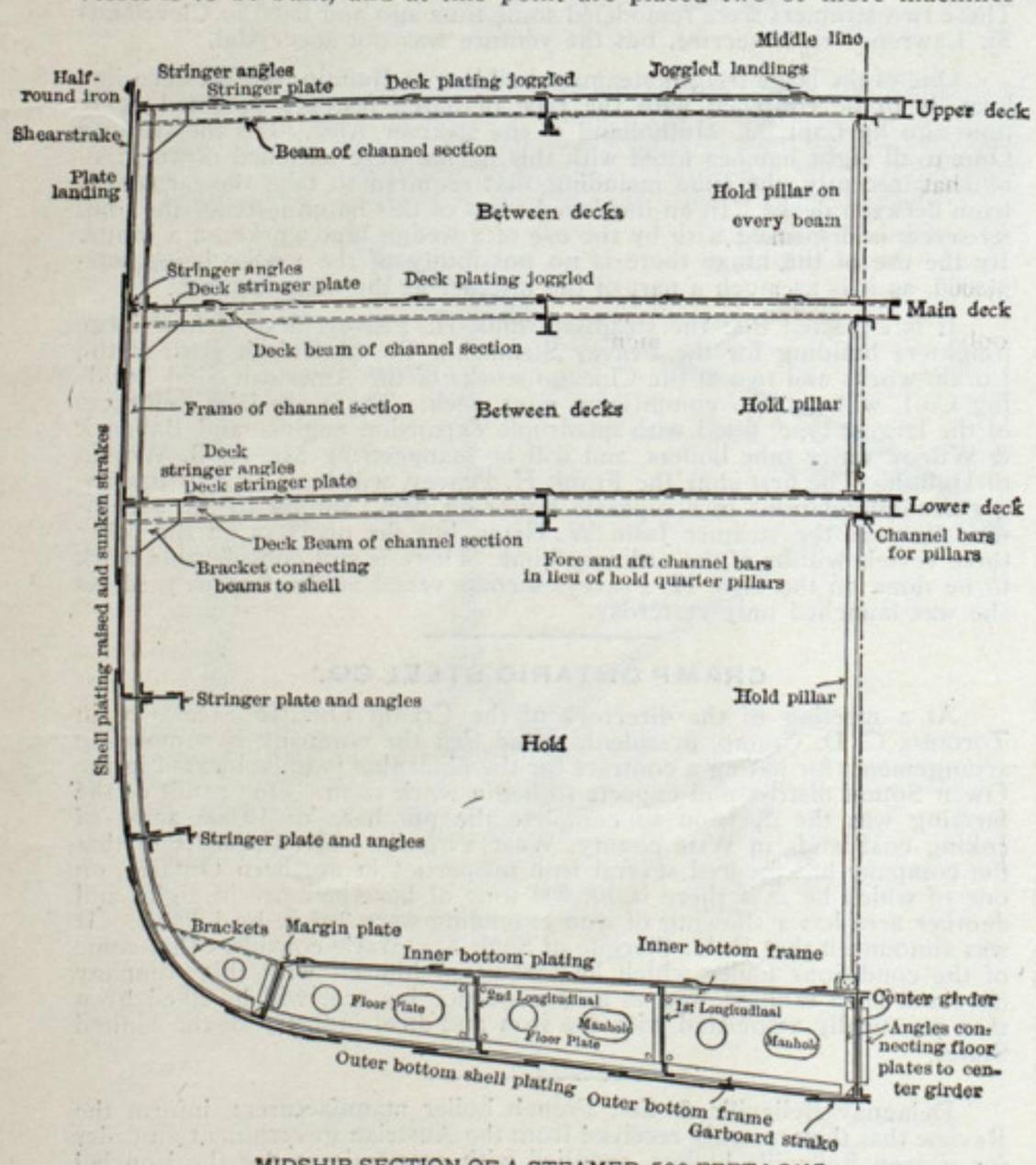


FIG. 1. PORTABLE HYDRAULIC RIVETER AS USED ON THE OCEANIC AT THE WORKS OF HARLAND & WOLFF, BELFAST.

is known among the prominent naval architects of Europe. By permission of the Engineering Magazine that part of Prof. Biles' article in the June number dealing with the use of hydraulic riveters in British ship yards is reprinted herewith:

The use of hydraulic riveting machines is now almost universal in Great Britain. Certain parts of a ship's structure, such as the frames and floors, are usually assembled at the head of the slipway upon which the vessel is to be built, and at this point are placed two or more machines



MIDSHIP SECTION OF A STEAMER 500 FEET LONG

ON THE DOUBLE BOTTOM PRINCIPLE

slung from the jib of a fixed crane by means of small lifts. A light staging is erected on which the parts rest while being riveted together. This operation usually takes place while the keel is being laid and the staging being erected. In the construction of a steamer with a double bottom (see midship section of 500-ft. steamer) the floors and connecting angles are riveted first. These are then lifted onto their position marked off on the keel, shored up, and faired, while the frames and connecting brackets are being riveted. After the margin plate is fitted the frames are lifted into position and faired. The riveters used in the work over the light staging are of a light pattern (see Figures 1, 2 and 3). No great gap is required, as in the framing work at this stage there is no corner work to do.

The riveter shown in Fig. 3 is merely a strong frame forming a gap at the end of which are the riveting dies. One of the dies, the closing die, forms the ram of the hydraulic cylinder. This riveter is provided with a clip, by sliding which along the frame the machine can be made to work with the cylinder underneath, instead of above, as shown, or in any intermediate position.

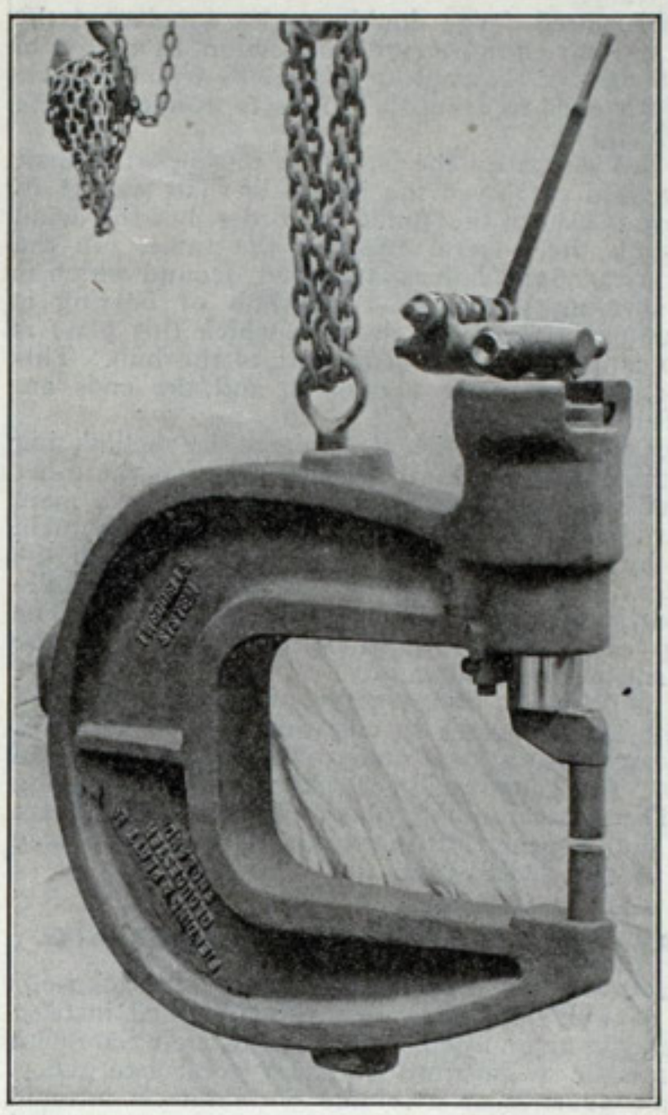


FIG. 2. PORTABLE DIRECT-ACTING HYDRAULIC RIVETER FOR SHIPS' FRAMES.

Fig. 5 is a riveter of the same type but provided with a bow hanger. The machine in this case rotates on the gudgeon through a complete circle, and in order to suspend it with the arms horizontal it is necessary only to connect the swivel onto the gudgeon instead of to the end of the bow. In moderate-sized vessels the whole of the frame, reverse frame, floor, and intercostal angles and beams may be riveted together before erection. In a few cases the beams may not come exactly fair with the rest, but with fair laying off and templating there should be no difficulty in obtaining a fair deck. Even if a few beams have to be cut and re-riveted after they are in place, there is a great saving in time and expense by adopting the method stated above.

With suitable arrangements for carrying them, hydraulic riveting machines may be used for almost any part of a vessel, except where flush-riveting is required. After the bottom framing has been erected, small traveling cranes for carrying these machines may readily be mounted on traveling rails. In this way all intercostals, keelsons, side stringers, may be hydraulic riveted. When it is remembered that the saving effected by the use of hydraulic riveting may amount to from 30 to 40 per cent.,

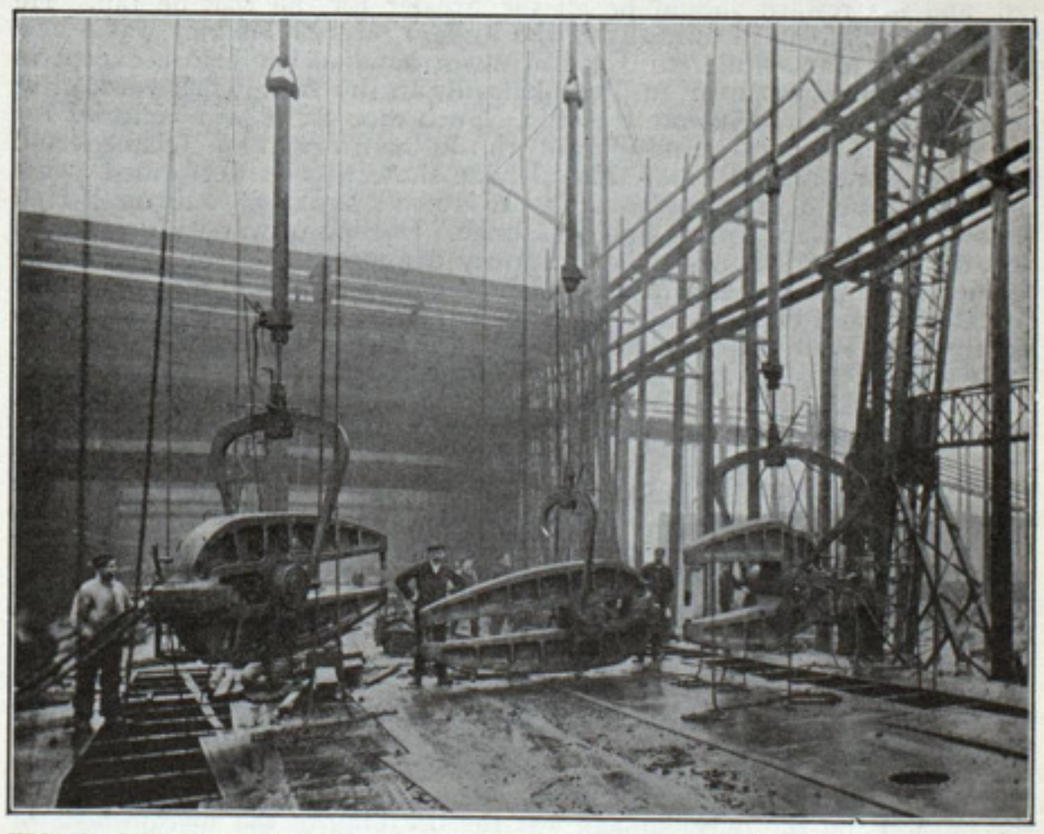


FIG. 3. HYDRAULIC RIVETING MACHINES AT WORK ON INNER BOTTOM OF STEAMSHIP OCEANIC, WORKS OF HARLAND & WOLFF, BELFAST.

to say nothing of the superior workmanship, the advantage of so arranging the work that machine work may be used whenever possible is evident. In the case of double-bottomed vessels nearly the whole of this plating may be machine riveted. The machines for this class of work require to have a much larger gap than those just considered, except perhaps those used for intercostal work in the inner bottom, and this means a heavier and more cumbersome machine to handle, and involves the use of correspondingly heavier cranes or some arrangement such as a traveling gantry.

Fig. 4 shows a portable hydraulic riveter which is used for this part of the construction. The riveting dies are clear of the hydraulic cylinder, so that they can get into corner work about the intercostals in the bottom. The levers carrying the dies oscillate on a strong steel center pin or gud-

geon. The hydraulic cylinder and ram are placed at the other end of these levers, and by making the center line of this cylinder follow the radial path of the arms of which the cylinder forms the outer end, connecting rods between the two levers are avoided. The thickness of the sheerstrake plates and doublings in the large class of vessels has made hydraulic riveting most imperative, owing to the correspondingly large size of rivets.

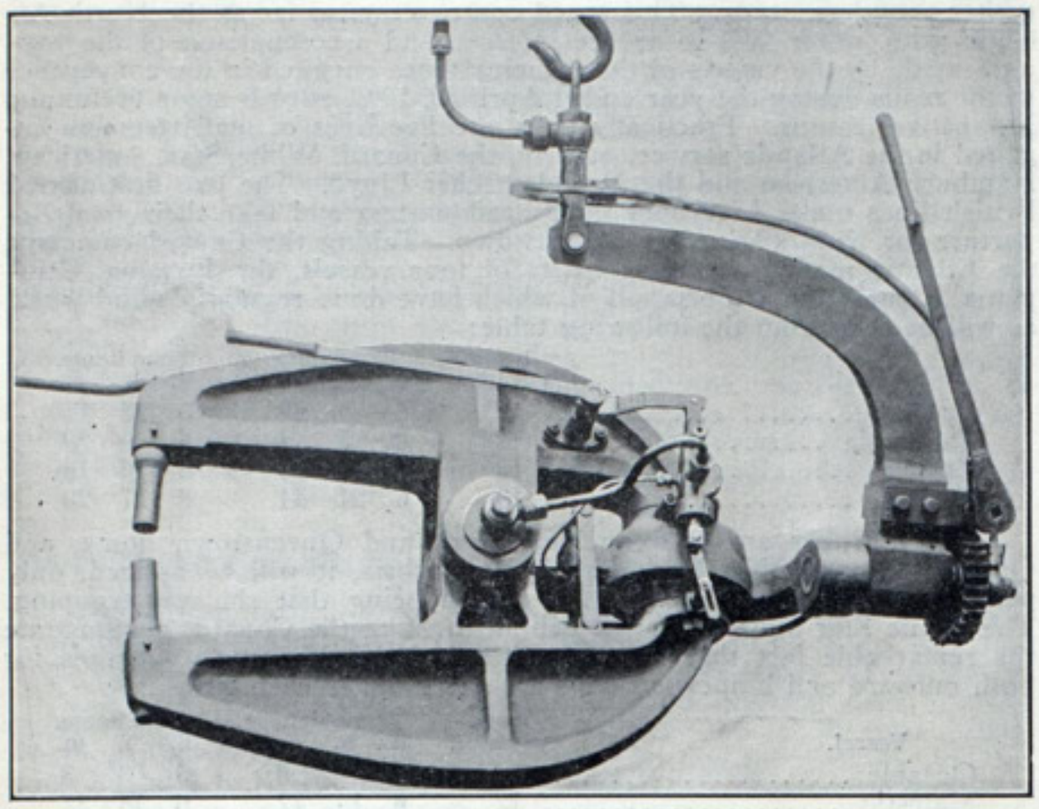


FIG. 4. PORTABLE HYDRAULIC RIVETER. HINGED TYPE FOR GENERAL WORK.

FALLACY OF FREE SHIP ARGUMENTS.

In his testimony before the industrial commission at Washington the other day Mr. Osborn Howes of Boston made the assertion that American carrying trade would revive quickly if restrictive laws should be repealed and if Americans should be permitted to purchase ships for American register wherever they liked. Mr. Howes' statements were widely quoted. Mr. A. R. Smith, in a letter to the Journal of Commerce, points out the fallacy of such argument. Mr. Smith says:

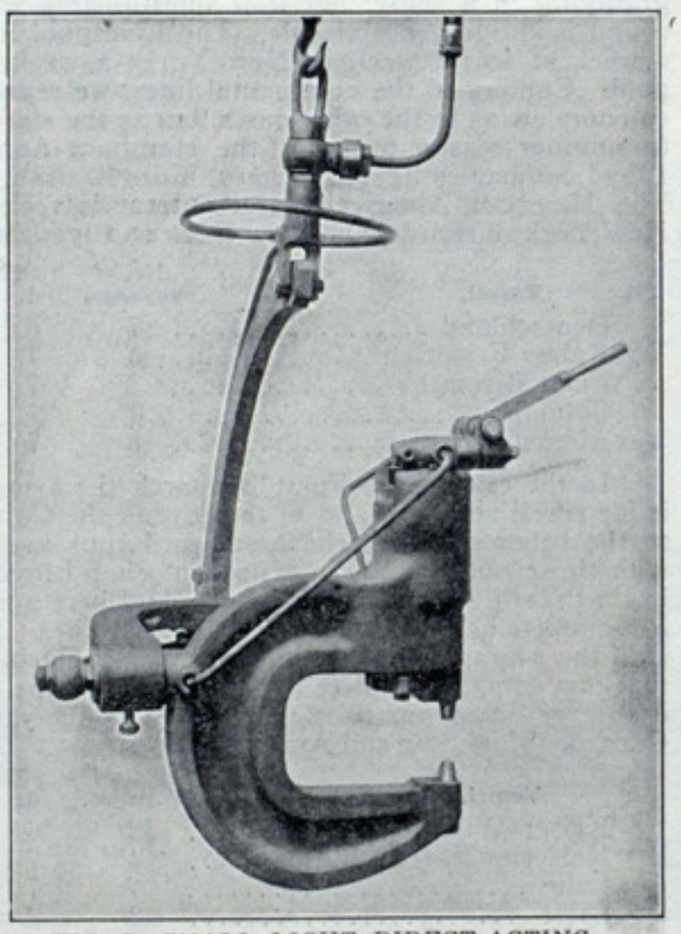


FIG. 5. SMALL LIGHT DIRECT-ACTING HYDRAULIC RIVETER.

"This is an oft repeated statement. It would be well for Mr. Howes, or those who believe as he does, to specify what laws now upon our statutes are 'restrictive' in respect of developing our merchant marine. He would, I know, extend our registry to any ship owned by an American citizen. But would he have the law repealed that requires the masters and officers of ships to be American citizens? Would he allow any foreigners to command and officer our ships, if competent? Would he repeal the law which fixes the food scale on board American ships at its present high standard of excellence? And would he be satisfied to subject our sailors to the inferior food scales of other nations? And if a vessel be foreign-built, commanded and officered by foreigners, with foreign food scale the standard, would he fly the American flag over her? For my part I would keep her under a foreign flag, in order to properly designate her as foreign in every respect save alone in ownership. Mr. Howes finds no support among American owners of foreign ships for his demand for American registry. He does not find any Americans with capital seeking the privilege of buying and registering foreign-built ships as American. Where, he should be asked, is the practical demand for the free American registry of foreign-built ships? It does not exist and never has existed. Both of the great political parties in congress, as recorded through their representatives upon the house committee on merchant marine and fisheries, put themselves squarely on record as not advocating the free American registry of foreign-built ships in the last congress, although Mr. Howes urged his views upon them at length.

"What now prevents 'American capitalists' from purchasing 'ships without regard to where they were constructed?' Has not Mr. J. P. Morgan just shown to all the world in his purchase of the British Leyland line that American capitalists are now permitted to purchase ships without regard to where they were constructed? Of course he intends to keep them under the British flag, as the British president of his company announced he would. But the people ought to know that, even if he were freely given American registry for his Leyland line ships, Mr. Morgan could not afford to accept it, because in doing so he would impose upon himself the higher cost of operating his ships under the American flag than is necessary if he keeps them under the British ensign. Right here is the point of difference between people who believe as Mr. Howes does and those who believe as I do. Mr. Howes would allow foreign-built ships to be registered as American, and he would allow foreigners to command and officer our ships; he would make foreign food scales the American standard in order that they could compete with foreign ships without aid from the government. He would disregard the other aids foreign ships receive in the way of mail pay, subsidies, subventions, naval reserve retainers, construction and navigation bounties, and suggest nothing by which American ships could overcome those advantages enjoyed by foreign ships. But those who believe as I do would make our merchant marine consist of American-built ships, in which American materials and labor had been employed; they would have them commanded and officered by American citizens, and, so far as possible, manned by our own citizens; they would maintain our American food scale of a better quality and larger quantity of food than obtain on foreign ships; and they would make good to the American owners of such ships, so built, so commanded, so officered, so manned and so provisioned, out of the national treasury, the extra cost of the construction and operation of those ships under the American flag for the aid they would be to our government—ships and men—in time of need, and for the larger markets they would open up abroad for our increasing surplus products. And the amount of that aid would be so fixed as to enable such American ships to successfully meet the competition of the subsidized and bountied ships of other nations."

NEW CLASSIFICATION OF THE NAVY.

An executive order of importance and of considerable historical interest has just been issued by the president, changing the classification of the vessels of our navy and rating them in a manner more in accord with modern conditions than has been the custom heretofore. The system of rating the vessels just abandoned was a makeshift; it was not provided by law and was an attempt to reconcile the rating laid down by law with the conditions of modern naval construction. For many years a ship's rating or classification depended on the number of guns carried. Before the war we had "ships of the line," carrying from eighty-four to 120 guns; frigates, each mounting fifty guns; sloops of war, of from 566 to 1726 tons, with from sixteen to twenty-four guns; brigs; screw frigates, with a tonnage of from 3,200 to 4,580, the Niagara displacing most, having twelve guns, while the Minnesota, one of the smallest, carried forty guns; and first and second-class "steam sloops," and smaller vessels. Tonnage and guns combined to give these vessels their rating.

At the end of the war there were four ratings, with subdivisions in each. First rates included sailing ships of 2,000 tons and upward, screw steamers of 2,500 tons and upward, paddle-wheel steamers of 2,400 tons and upward, and ironclad steamers of 3,300 tons and upward. The other ratings were divided in the same way. A few years later, in 1867, the ratings were simplified; first rates were all vessels of 2,400 tons and over, second rates were from 1,200 to 2,400 tons, third rates from 600 to 1,200 tons, fourth rates under 600 tons. The scale of rating was changed from time to time, but never in a way to keep pace with the growth of the navy, so that in the system just given up we had such anomalies as the Alabama of 11,565 tons and the Chicago of 5,000 tons rating the same; the converted cruiser Buffalo, 6,888 tons, and the protected cruiser Boston, 3,000 tons, as second rates, while the Dixie of 6,888 tons, and the Princeton of 1,000 tons, were carried as third rates.

The new system groups the vessels as follows: First rate, men-of-war only, of 8,000 tons displacement and upward; second rate, men-of-war of more than 4,000 tons and less than 8,000 tons, together with converted auxiliary vessels of 6,000 tons and over, except special ships, colliers, repair ships, tank steamers and the like; third rates, men-of-war from 1,000 to 4,000 tons, and converted and auxiliary vessels of from 1,000 to 6,000 tons, and colliers, refrigerating ships, supply ships, distilling ships, tank steamers, repair ships, hospital ships, and other vessels used for special purposes, of 4,000 tons and over; fourth rate, all other rated vessels. Torpedo-boat destroyers, torpedo boats, tugs, sailing vessels and receiving ships are not to be rated.

The new order changes the rating of several well-known ships of the navy, in each case lowering their position in the navy list. Thus the Texas, which has been a second-class battleship of the first rate becomes a second-rate battleship; the Columbia and Minneapolis, cruisers, and the Olympia, Dewey's flagship, also a cruiser, become second rate vessels; all of the battleships launched recently, as well as all of those building, go into the first-rate list, as do the armored cruisers under construction, so that the net loss of vessels of the first rate is very small. As some of the new vessels laid down have a tonnage displacement of nearly twice the minimum required for vessels of the first rate—the Georgia, for example, having one of 15,000 tons where only 8,000 are needed—it is possible that a further change in classification may be made in the near future. It is not likely that ships of over 15,000 tons will for so long a time as hitherto be rated as of the same class as those of barely 8,000 tons.

The new order puts in formal shape a custom relating to command which has been followed for some years. An admiral or rear admiral may properly command a fleet, a rear admiral may command a squadron, a captain a ship of the first or second rate, and a vessel not rated; a commander, a ship of the second or third rate or one not rated; a lieutenant-commander, a ship of the third or fourth rate or one not rated a lieutenant, a ship of the fourth rate, a destroyer or a torpedo boat, a tug, tender or a vessel not rated; a junior lieutenant a torpedo boat, tug, tender or unrated ship, and an ensign a torpedo boat, tug, or unrated ship. These are merely the commands appropriate to the respective ranks. So long as no provision is made for increasing the number of officers proportionately with the vessels of the navy, it is to be expected that officers below the rank of commander will have higher commands than those strictly appropriate to their rank.

MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

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Charles T. Yerkes has just told the business men of London that they do not know the value of a scrap heap. This is epigrammatic, but true. Scrap heaps are valuable assets. Mr. Carnegie recently sold a scrap heap for $210,000,000. He knew the value of a scrap heap better than any other living man. He had been dealing in scrap heaps all his life, and his intimate knowledge of their value caused him to place this exceedingly high figure upon the latest one which he possessed. Other men not so familiar with the actual and prospective value of scrap heaps might have put a less figure upon it. But there never has been a time when Andrew Carnegie did not know what he was doing. Scrap heaps are intricate things to deal with. The main point is to determine the exact moment when they become scrap heaps. It is a nerve destroying business. Irrevocable mischief would be done if the scrap heap should be plucked before it was quite ripe. Andrew Carnegie was the only man of his time who could look at a magnificent machine, costing hundreds of thousands of dollars, and doing the work of hundreds of men, and deliberately dismantle it on the ground that it was scrap. He did it repeatedly and he never misjudged. The result is that his interest in the Carnegie works, a mere succession of scrap heaps, brought him $210,000,000 in 5 per cent. bonds and a university training to every Scotch boy that hereafter chances to be born. Yerkes made his remark when he secured the contract to equip the underground railroad of London with electric motor power. It necessitated the ripping up of expensive machinery which, doubtless, looked like a great waste of money. Indeed antiquated machinery and conservative methods have done much to deprive England of its industrial supremacy.

The slaughter of the millionaire continues. Charles M. Schwab is a worthy disciple of Carnegie. His motto seems to be that no millionaires need apply to him for employment. If he catches any of them in his employ he decapitates them immediately. More than one millionaire is quaking in his boots. Schwab is going on the theory that if a man has made a large fortune independently he is apt to take himself too seriously. He does not work well in combination. He has passed the shirt-sleeve stage and wants to pose. Schwab cares neither for dignity nor dollars. What he wants at the head of each one of the important departments of the great corporation is an earnest and impetuous worker and he will get him if he has to sacrifice millionaires by the score. His theory is doubtless correct. It is probably the only way whereby so vast an institution can be managed. The steel corporation will have to meet vigorous competition from all sides and it cannot have in its employ men whom wealth has made indolent. The millionaire, as a working force in the world's affairs, is a doomed man.

Messrs. Andrew Carnegie and Arthur Chamberlain have been soothing the British soul lately. Neither of them takes a gloomy view of the British situation. Mr. Carnegie says that it is difficult to imagine anything more unfair than to compare a small and mature country, already working her natural resources to the utmost, with a far larger land, practically in its first youth and with only the fringe of its natural supplies so far touched. The only comparison approaching fairness between these two countries is the proportional wealth per head, and this, as Mr. Carnegie is at some pains to show, leaves Great Britain still well in front of her competitors. Nor does Mr. Carnegie look upon reduced exports as a bad sign. The mainstay of every manufacturing industry is the home market. Unless manufacturers have a large demand for their products at home they are not in a position to compete successfully with any one abroad.

The acquisition of the Pennsylvania Steel Co. and the Cambria Steel Co. by the Pennsylvania Railroad Co. is not to be regarded as a hostile step to the United States Steel Corporation. On the contrary it insures harmony. The two steel companies will not be operated as Pennsylvania railroad annexes but will be managed, as heretofore, as independent concerns, supplying the old and securing as many new customers as possible The railroad company has, indeed, secured a check upon the steel corporation, but one more conducive to peace than otherwise. The company will continue to be a heavy buyer of steel rails from the great corporation; and the steel corporation will continue to be, as hitherto, the heaviest patron of the Pennsylvania railroad.

ATLANTIC MAIL RECORDS.

From Syren & Shipping, London.

A comparison of ocean speeds is always an interesting, and not altogether profitless, study. This speed controversy, so far as the North Atlantic goes, never fails to arouse interest, and a comparison of the voyages made by the vessels of the principal lines engaged in the conveyance of the mails during the year ended April 30, 1901, affords some useful and instructive lessons. Practically there are five lines of mail steamers engaged in the Atlantic service, namely, the Cunard, White Star, American, Hamburg-American and the Norddeutscher Lloyd. The two first-named British lines make Liverpool their headquarters and take their final departure for New York from Queenstown. Taking the Cunard company, the Atlantic mail boat fleet consists of four vessels, the Lucania, Campania, Etruria and Umbria, all of which have done regularly good work, as will be seen from the following table:

Vessel.	No. of voyages.	Time out. d.	h.	m.	Time home. d.	h.	m.
Lucania	12	6	0	29	5	22	11
Campania	12	6	5	8	6	0	29
Etruria	12	6	14	12	6	16	18
Umbria	10	6	21	44	6	17	29

The journeys are between New York and Queenstown home, and Queenstown and New York out. The Umbria, it will be noticed, only performed ten round voyages, the reason being that she was trooping. The White Star figures, though behind those of the Cunard, demonstrate the remarkable fact that the Oceanic's and the Majestic's averages for both outward and homeward trips are the same in each case.

Vessel.	No. of voyages.	Time out. d.	h.	m.	Time home. d.	h.	m.
Oceanic	12	6	3	3	6	3	3
Majestic	12	6	14	17	6	14	17
Teutonic	12	6	15	21	6	16	23
Germanic	12	7	19	45	7	12	2

The American line has had three fast vessels running between Southampton and New York via Cherbourg. They were the St. Paul, the St. Louis and the New York. In this case the time is between Cherbourg and New York out, and between New York and Southampton on the homeward trip.

Vessel.	No. of voyages.	Time out. d.	h.	m.	Time home. d.	h.	m.
St. Paul	10	6	22	55	6	20	52
St. Louis	16	7	1	0	7	2	54
New York	14	7	13	8	7	4	48

That the St. Louis has not long been idle during the year is obvious from the fact that she has made sixteen round voyages. This may be gratifying in a sense, but it is questionable whether such a quick turn round is altogether advisable. The Liverpool lines go on the principle of a week at sea; a week in New York; a week at sea; a week in Liverpool. Coming to the continental lines, we regret that our figures are not so complete as in the other cases, but as the statistics we give apply mainly to summer season passages, the Hamburg-American and Norddeutscher Lloyd companies figure, perhaps, more favorably than they rightly should. The Hamburg-American vessels' time is reckoned from Cherbourg to New York outwards, and New York to Plymouth homewards.

Vessel.	No. of voyages.	Time out. d.	h.	m.	Time home. d.	h.	m.
Deutschland	7	6	1	28	5	13	30
Kaiser Friedrich	5	7	5	24	6	15	5
Furst Bismarck	8	7	5	3	6	14	56
Columbia	3	7	6	35	6	23	48
Augusta Victoria	5	7	16	57	7	3	53

In the case of the Furst Bismarck the average on the homeward run is for seven voyages; and in the case of the Columbia for eight; in regard to the other steamers the homeward runs averaged coincide in number with those outward. The Norddeutscher Lloyd had five vessels engaged in the North Atlantic mail service, and here again our information is not so complete as in the case of the British lines. But the runs for which we give the average times were made mainly during the summer months, so that our data, incomplete as it is, rather helps than handicaps the Norddeutscher in comparison with the all-the-year-round services of the Cunard, White Star and American lines.

Vessel.	No. of voyages.	Time out. d.	h.	m.	Time home. d.	h.	m.
Kaiser Wilhelm	12	6	4	54	6	0	26
Kaiserin Maria Theresa	4	7	3	16	..	..	..
Lahn	7	7	18	39	7	14	35
Saale	2	8	0	5	7	19	25
Trave	4	8	2	23	..	..	..

In the case of the Kaiserin Maria Theresa and the Trave we have no information as to their homeward passages, while the 7 days 19 hours and 25 minutes of the Saale refers to a single homeward voyage, and the average 7 days 14 hours 35 minutes of the Lahn is obtained from three homeward voyages. The vessels we have listed of the Norddeutscher Lloyd fleet ran between Cherbourg and New York out, and New York to Cherbourg home. We have taken the records stated above and worked out the average passages of the different lines, both out and home, as follows:

Line.	Time out. d.	h.	m.	Time home. d.	h.	m.
Cunard	6	10	23	6	8	7
White Star	6	19	6	6	17	26
American	7	4	21	7	1	31
Hamburg-American	7	2	31	6	14	8
Norddeutscher Lloyd	7	10	39	7	3	28

The Atlantic Works, Incorporated, of Philadelphia, recently shipped to the Pennsylvania Railroad Co. for use in Hoboken (N. J.) shops one of their adjustable bevel band saw machines, which are especially adapted to ship work.

LARGE GANTRY CRANE AT NEWPORT NEWS.

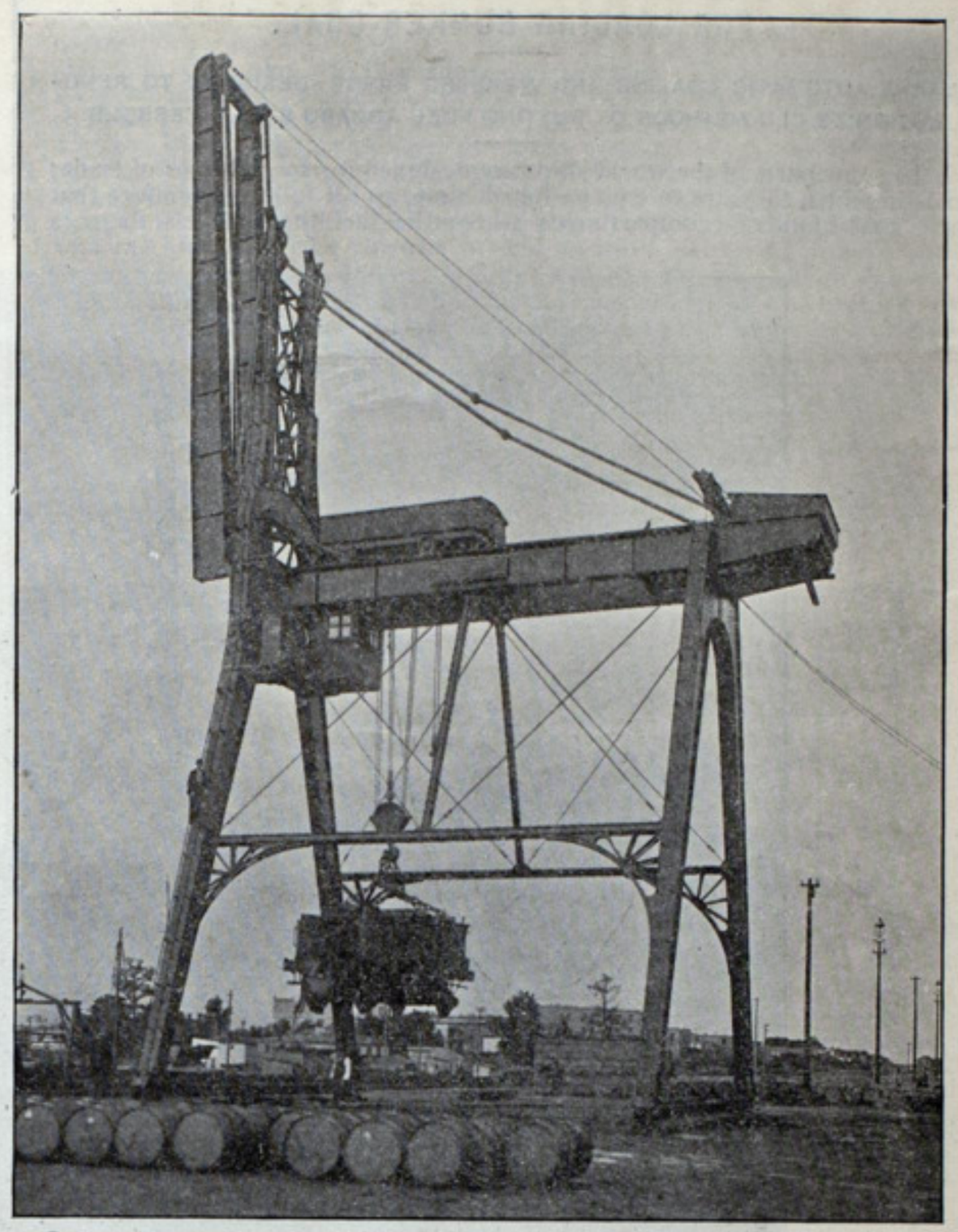
The Wellman-Seaver Co. of Cleveland has designed and built for the Chesapeake & Ohio Railroad Co., at Newport News, Va., a gantry crane of very large capacity. The crane has a folding jib, and its principal duty will consist in the loading of heavy articles, such as locomotives and their tenders, on board ships lying alongside of the wharf upon which the crane is located. At present the crane is erected upon a wharf of timber construction, but it is the intention in the near future to move the crane to another wharf, which will be provided with tracks upon which the crane will traverse. At present, however, the crane is anchored down to a pier. As shown on one of the illustrations the projecting end of the jib is so arranged that it can be lifted up out of the way of the funnels and masts of the ships. The load can be picked up from the wharf and traversed out through the legs of the crane and placed on board the ship. The crane has a lifting capacity of 60,000 lbs. on the main hoist and 20,000 lbs. on the auxiliary hoist. It is operated by means of electricity, and all of the gearing is provided with housings and covers to protect it from the weather. This crane is one of the numerous improvements now being made by the Chesapeake & Ohio Railroad Co. at Newport News, Va., and will add largely to the shipping facilities at that port.

COAL TRADE BETWEEN LAKE ONTARIO AND MONTREAL.

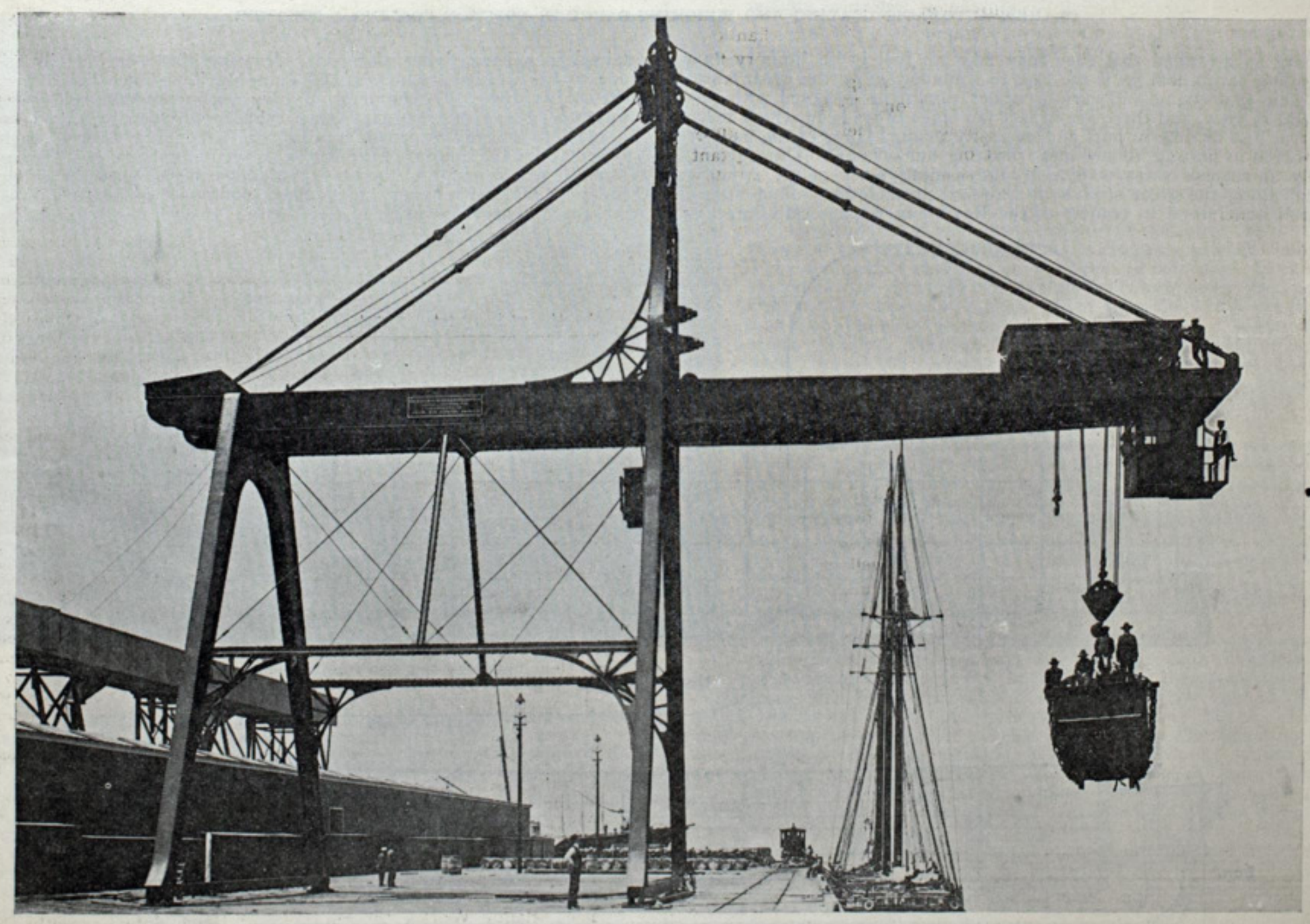
One of the direct results of the deepening of Canada's system of canals in the St. Lawrence to 14 ft. is the announcement that a new corporation has been formed, composed of leading Canadian and American capitalists, for the purpose of developing the coal carrying trade between the American ports on Lake Ontario and the City of Montreal. The Montreal Coal & Towing Co. having secured a charter from the state of West Virginia, will not only be able to take coal to Montreal but do a coasting trade as well between the American lake ports. An interesting feature in this new enterprise is the peculiar kind of boat or barge selected for the work. They are designed from the old pin-plat of the French Canadian voyageur, will carry 800 tons and cost $8,000. The company is capitalized at $250,000, and starts with a well equipped fleet. The directors are John Torrance, Henry Miles, W. F. Torrance, S. O. Shorey and G. Ernest Muir. Mr. W. F. Torrance is president and Mr. Muir secretary and treasurer.

The United States hydrographic office has already published a neat, clear chart of Michipicoten harbor, just above the Sault on the north shore of Lake Superior where docks of the new Clergue railway and ore mines are situated. The survey upon which the chart is based was made only a year ago. Corrections are made in the chart up to June of this year. The chart may be had from the Marine Review at 20 cents.

An Ottawa dispatch says that the dominion government is again getting ready to advertise for tenders for a fast steamship service between Canadian ports and the United Kingdom.



GANTRY CRANE ON DOCKS OF CHESAPEAKE & OHIO RY. CO., NEWPORT NEWS.



GANTRY CRANES ON DOCKS OF CHESAPEAKE & OHIO RY. CO., NEWPORT NEWS, VA.

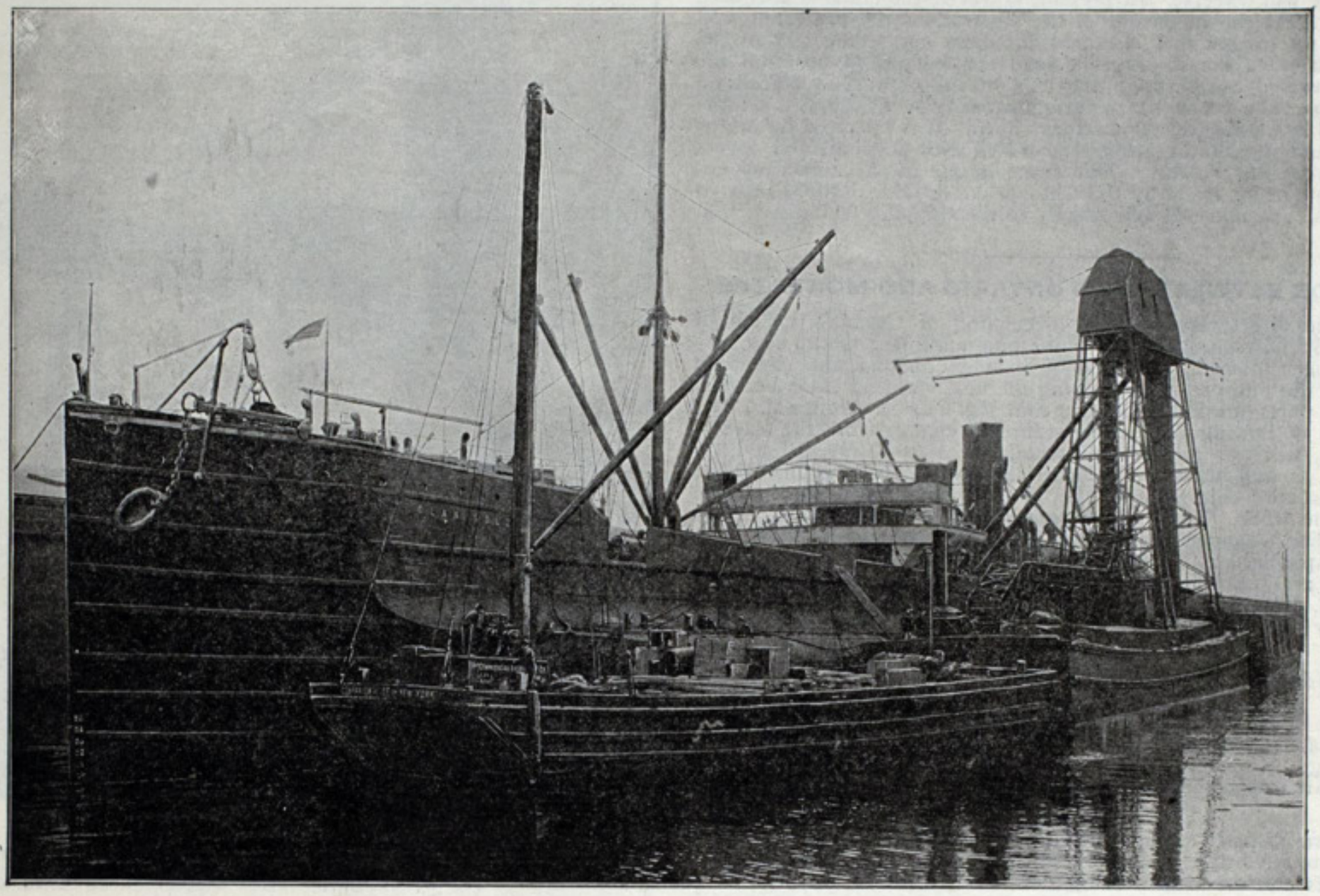
Designed and built by Wellman-Seaver Engineering Co , Cleveland.

FOR LOADING BUNKER COAL.

CLARKE AUTOMATIC COALING AND WEIGHING BARGE—DESIGNED TO REVOLUTIONIZE OLD METHODS OF PUTTING FUEL ABOARD STEAM VESSELS.

In some parts of the world ships are designed for special lines of trade; trade in which they are to engage for all time, and it follows therefore that their coal bunkers (compartments where the fuel that propels them is stored) are so arranged that they may take on fuel in an hour or two while loading cargo coal, as is the case to some extent on the great lakes. But the ship that engages in various trades cannot be designed with this special end in view, and there are in fact few lines of trade in which there is not great loss of time in port and excessive manual labor of the hardest kind involved in putting aboard and trimming bunker coal. This subject, especially as regards ships trading to the leading ports of the Atlantic coast and along the great stretch of seaboard around the United States, is too well understood to readers of the Review to require elaborate explanation preparatory to describing a method of coaling steamships which has been in successful operation for the past year in New York harbor and which will prove very interesting.

The method referred to has been introduced by the Automatic Coaling & Weighing Barge Co., No. 29 Broadway, New York city, to whom we are indebted for the accompanying illustrations, and for the opportunity of making an inspection of the barge while in operation. The automatic barge is designed to effect a revolution in the old-fashioned method of coaling steamers, which consists in shoveling into buckets the coal contained in a barge lying alongside, elevating these buckets by means of one of the steamer's winches, and dumping them into the bunker, where the coal is stowed by trimmers. By the new method the coal is contained in a steel barge of 1,000 gross tons capacity, divided by transverse bulkheads into several compartments or coal bins. The floor of each bin is raised above the bottom of the barge, to accommodate a passageway which runs the whole length of the bins, just above the keel, and in which a train of buckets is drawn by an endless chain, composed of flat steel links. There are three square openings in the bottom of each bin, closed by sliding



CLARKE AUTOMATIC COALING AND WEIGHING BARGE IN POSITION COALING A STEAMER.

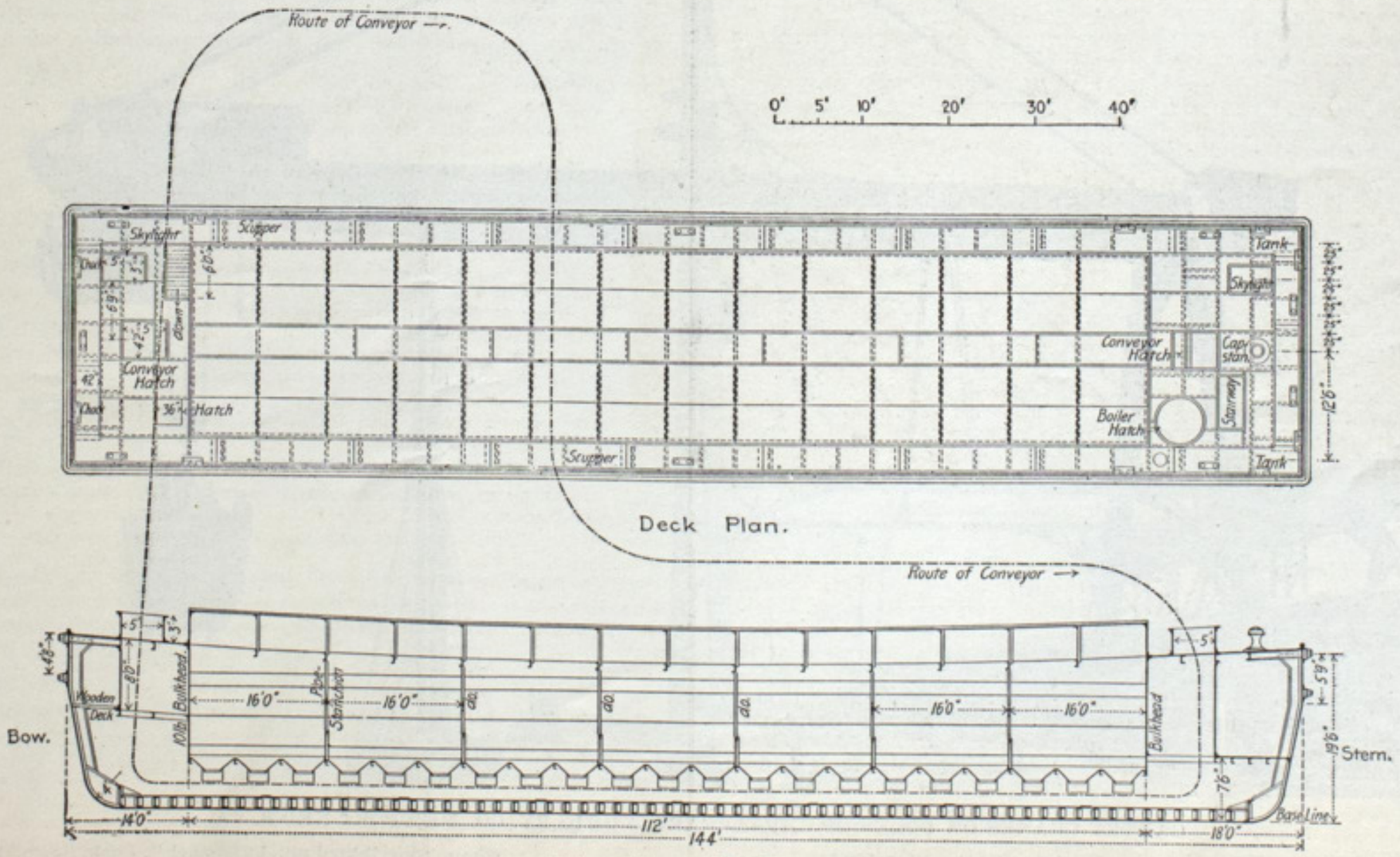


FIG. 1, AUTOMATIC COALING BARGE.

doors, and, as each hole is opened, the coal lying above it slides down into the buckets. The train of buckets is moved by means of a steam engine in the rear compartment of the barge, through the horizontal passageway, then vertically upwards in a tower, which contains two automatic weighing and recording scales, into one of which each alternate bucket is dumped. The coal then slides from the scales into two telescopic steel tubes, which deliver it into the bunkers of the steamer. The principle of the coaling barge is therefore similar to that of the well-known floating grain elevator, but the machinery is much heavier, and contains many devices to facilitate the handling of a somewhat intractable material like coal. The barge delivers the coal steadily at the rate of 125 gross tons per hour, and has been operated for several hours at a time

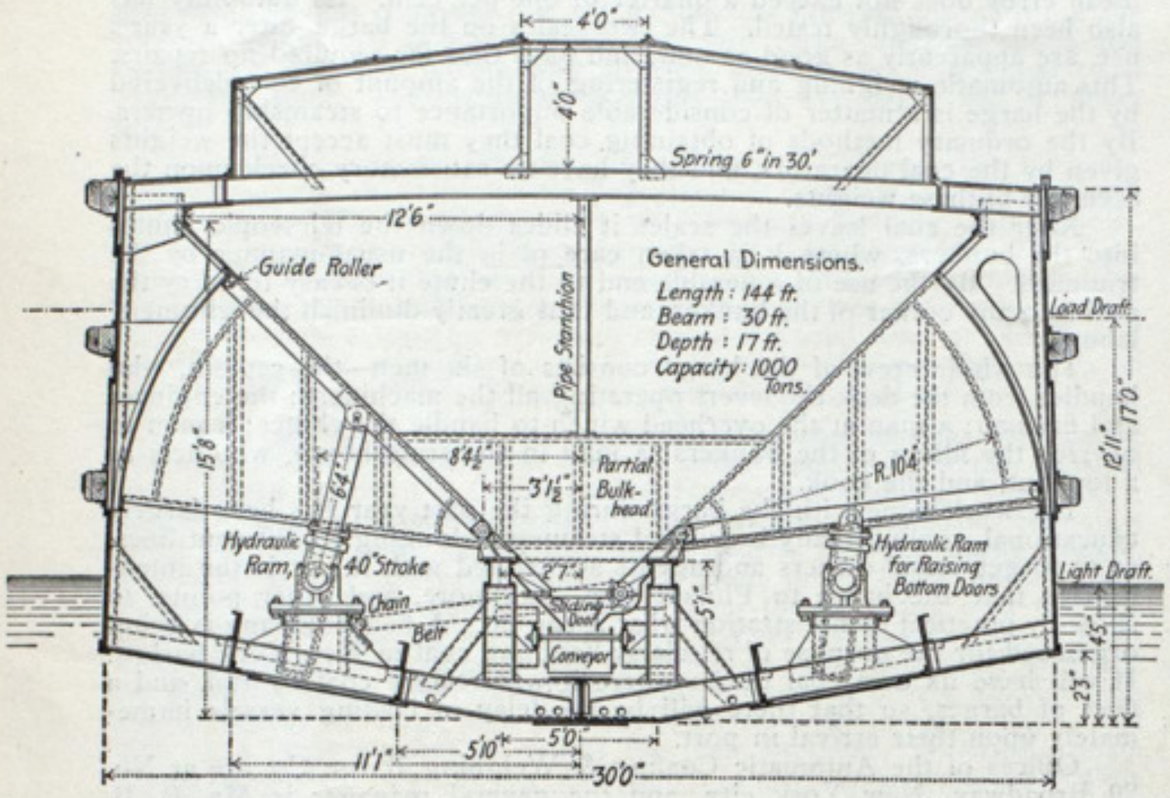


FIG. 2, AUTOMATIC COALING BARGE.

at a rate of 135 tons. The whole operation is almost noiseless and free from dust, and it is accomplished entirely by the machinery of the barge, without any hand labor, and without the assistance of any of the machinery or crew of the steamer.

Referring to the illustration, Fig. 1 is a longitudinal vertical section and plan of the barge. Its dimensions are: Length, 144 ft.; beam, 30 ft.; depth, 18 ft. from deck to keel; draft loaded, 14 ft. The rear compartment contains the boiler, engine, hydraulic pump, gearing and other appurte-

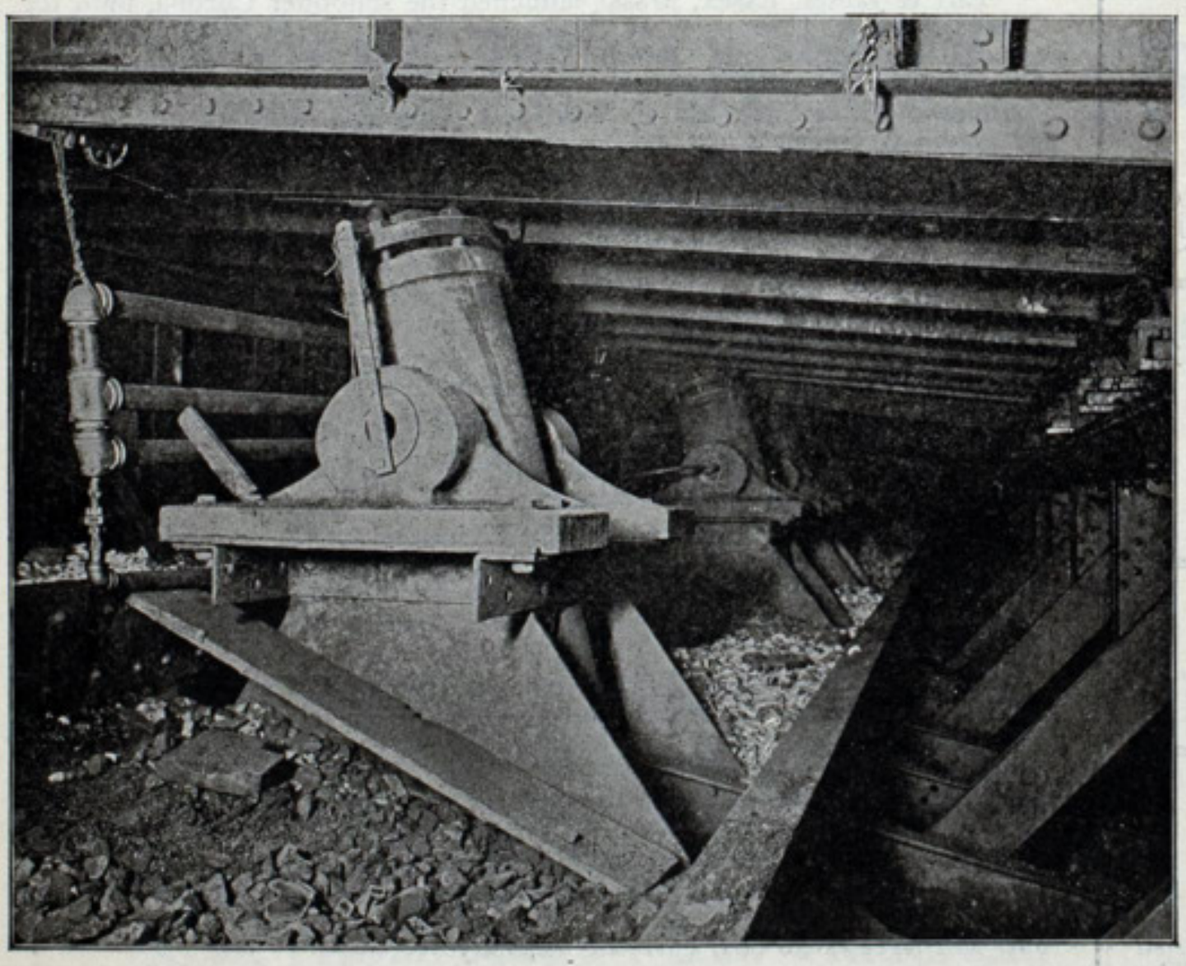
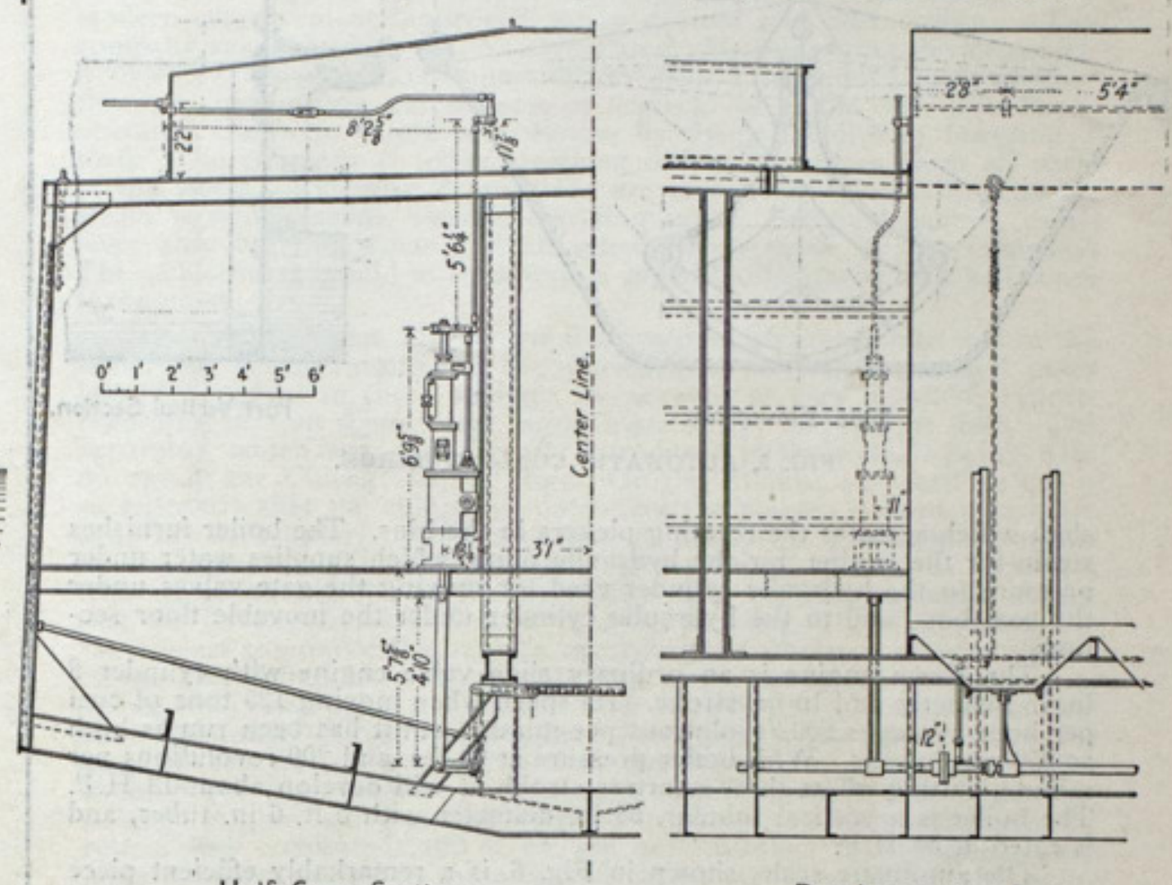


FIG. 3, AUTOMATIC COALING BARGE.

nances of a complete power plant. The forward compartment contains the quarters for the crew. The other compartments are all devoted to coal bins. Each bin is 16 ft. long (in the direction of the length of the barge) and 28 ft. wide at its greatest horizontal section, and each discharges its coal into three openings, 22 in. long by 24 in. wide at its bottom.

Fig. 2 shows a transverse vertical section of the barge, taken through one of the coal bins, and this view shows several of the most important elements of the barge's mechanism. First of these is the elevating floor, which is shown in its lowest position at the right hand of Fig. 3, and in its highest position to the left. Each of the movable floor sections is hinged at its lower edge, and at the outer edge almost touches the inner surface of the sides of the bin, which are formed in a curve, as is clearly shown in the drawing. Each of these movable sections of the floor is 16 ft. long and 11 ft. wide, is strongly built and therefore heavy, and supports a considerable load of coal. The lifting of each one is accomplished by means of two hydraulic lifting rams, each with a plunger 6 in. in diameter and 42 in. in stroke, which oscillate on trunnions. There being two lifting jacks to each movable section of the floor, it is essential that each one of the pair moves in harmony with the other, so that neither one can get in advance of the other, although the loads upon the two may be very unequal. This is accomplished by means of an automatic two-way hydraulic valve, which governs the admission of water to both of the cylinders. As long as the outer edge of the moving floor section, which is being lifted, remains horizontal the valve is in mid-position, delivering water equally to each of the two cylinders; but the instant that one end of the outer edge becomes tilted upward, the valve is moved so as to check or stop the water flowing into the cylinder nearest that end until the horizontal position of the outer edge is restored. This ingenious application of a single valve to control two or more hydraulic lifts connected to a single moving platform is adaptable to many other purposes besides the one for



Half Cross Section. Part Longitudinal Section.

FIG. 4, AUTOMATIC COALING BARGE.

which it is used in this barge. It is the invention of Mr. Clarke and is fully protected by patents.

Fig. 3 is a photographic view of hydraulic lifts as applied under the moving floors of several of the bins. All of the lifts are supplied with water pressure from a hydraulic pump and accumulator located in the compartment at the rear of the barge. The valves controlling each pair of lifts are located near them, but the handles by which they are operated are located at a convenient position above them on the upper deck, a long rod connecting each valve with its handle.

The next features connected with the coal bin to be considered are the gates or doors which close the two rectangular openings in the bottom of each bin, and the method of operating them. They are simply flat cast iron plates supported and operated on specially designed bearings by which the usual clogging of coal is eliminated. They are opened and shut by a system of bell crank levers, clearly shown in Fig. 4, which are operated through easily detachable jaw clutches, by means of a shaft which runs the whole length of the coal bins, back to the stern compartment where it is actuated by a steam cylinder. Handles located above each coal bin on the upper deck control the clutches belonging to the levers of each of the gates, and also the valves of the cylinder, to rotate the shaft and open or shut at will any one of the gates when its clutch has been thrown into action.

Still another mechanical feature connected with the coal bin is a rotating picker bar, shown just above the gate at the bottom of the bin in Fig. 2. The coal in sliding down to the openings in the bottom of the bin often becomes blocked by wedging or scaffolding itself across the inclined surfaces of the lower part of the bin, but it is easily started sliding again if it is touched with a bar or pick. This is the office of the rotating picker. It is driven by chain gearing from a shaft which is carried from the coal bins back to the engine room, and is, at will, connected or disconnected from the shaft by a clutch operated from the deck.

Leaving now the coal bins we come to the passageway underneath them, which contains a railroad track and a continuous train of buckets, called gravity buckets, which are pivoted and swung from steel links on both sides. The links are carried on wheels which run on the rails. The buckets are shown in Fig. 5. The lip of each overlaps the edge of its neighbor, so that no coal can drop between the buckets. As the buckets become loaded by passing under an opening in the bottom of one of the coal bins, they then pass under the edge of this opening, where the trimming above referred to takes off the surplus load and lets the buckets pass one after the other each with a uniform level load. The buckets while pivoted in the links are kept in a horizontal position by an arrangement of guide rails. The train of buckets is moved along by means of the links to a point in the forward compartment, where its direction is changed to the vertical by the links passing 90° around a wheel, and its motion then continues upward, guided by vertical tracks supported on the framework of a tower to the top of the latter, where the tracks bend to the horizontal. The buckets then travel horizontally a short distance, when the coal in each alternate bucket is dumped into a hopper leading

to a weighing scale located just below. The second bucket of each pair is dumped when it reaches the hopper of a second scale, a little further along. The empty buckets then descend in a second tower to a point a few feet above the deck, then travel to a point above the stern compartment into which they descend to the level of the passageway. In this compartment the links which carry the buckets, forming an endless chain, engage with the heavy sprocket wheel, which is driven by gearing from the engine.

The work done by the engine when the barge is delivering coal at the rate of 125 gross tons per hour, is that of elevating this coal from the level of the track in the bottom to the level of the track above the scales, a distance of 75 ft., or 125 x 2,240 x 75=21,000,000 ft. lbs., which is equivalent to 10.6 H.P., besides the overcoming of the frictional resistance of the moving buckets, links and gearing, which is about 1 H.P. A trifling amount of power of the engine is also used in operating the horizontal

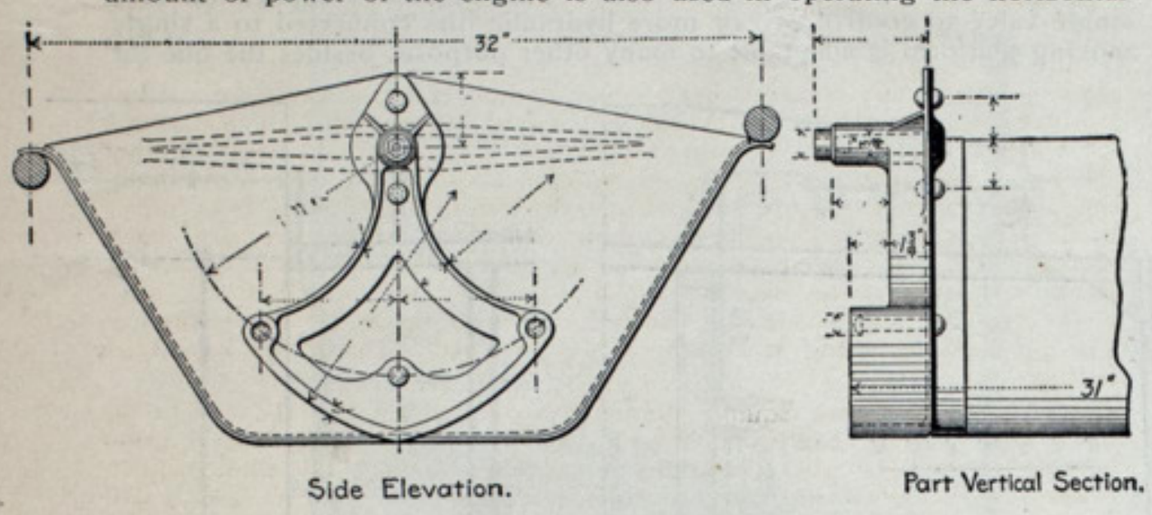


FIG. 5, AUTOMATIC COALING BARGE.

shaft which actuates the rotating pickers in the bins. The boiler furnishes steam for the engine, for the hydraulic pump which supplies water under pressure to the hydraulic cylinder used for moving the gate valves under the coal bins, and to the hydraulic cylinder under the movable floor sections.

The steam engine is an ordinary slide valve engine with cylinder 8 in. in diameter and 10 in. stroke. Its speed when moving 125 tons of coal per hour averages 200 revolutions per minute, but it has been run as high as 250 revolutions. With boiler pressure at 60 lbs. and 200 revolutions per minute, cutting off at three-quarters stroke, it will develop about 13 H.P. The boiler is a vertical tubular, 58 in. diameter with 5 ft. 6 in. tubes, and is rated at 50 H.P.

The automatic scale, shown in Fig. 6, is a remarkably efficient piece of mechanism. It consists of a rotating cylinder divided by sheet steel partitions into four quadrantal sections or compartments, each capable of holding a quarter of a ton, or 560 lbs. of coal. In its normal position for

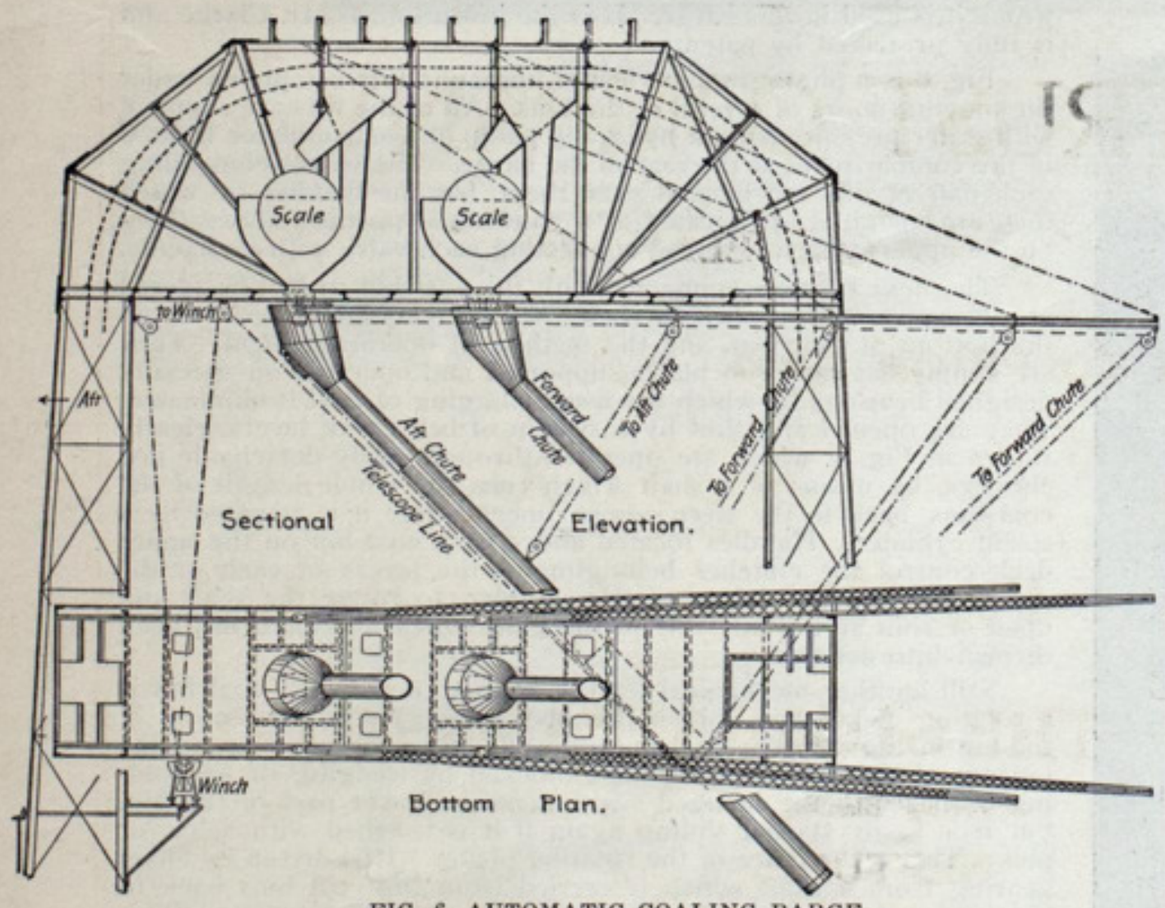


FIG. 6, AUTOMATIC COALING BARGE.

receiving coal the partitions stand at an angle of 45° with the vertical, so that the opening of one of the compartments is directly upward. The whole weight of the cylinder, together with the coal that may be in one compartment, is carried on two journals, the boxes of which are movable vertically a distance of three inches, between guides, the bearing of the boxes on the vertical guides being a set of four wheels, to diminish friction. The weight of each of these boxes is supported by well-made and nearly frictionless chain, carried over two ball-bearing pulleys to a heavy counterweight, as shown in the illustration. These ball-bearing pulleys take the place of the knife edge pivots of ordinary scales. They are enclosed in dust proof casings.

The angle of the hopper delivering coal to the scale is such that the coal slides down it at a moderate rate, and the edge of the hopper is so close to the scale that when the compartment of the scale is full the coal is blocked in the hopper, and there is no coal falling through the air. The instant that there are 560 lbs. of coal in the scale the counterweight is overbalanced, and the scale begins to descend, a knife actuated by a heavy weight suddenly cuts off the descending stream of coal, a latch is thrown open, the scale rotates through an angle of 90° and dumps its coal into the hopper below, whence it slides through the telescopic tubes to the coal bunker in the steamer. The coal having fallen out of the scale, the counterweight brings the rotating cylinder back to its highest position, with the next compartment in place to receive coal, and with the cutting-off knife thrown back from the descending stream. A mechanical counting device on each scale registers the number of dumps, and the record is repeated by means of an electric connection to the register on the deck.

The barge being supplied with two scales, and running at the rate of 125 gross tons per hour, each scale will be dumped 250 times in an hour, or a little over four times per minute, thus allowing ample time for filling without shock. The accuracy of the scale is quite remarkable. Repeated tests under the most rapid conditions of working have shown that its mean error does not exceed a quarter of one per cent. Its durability has also been thoroughly tested. The two scales on the barge, after a year's use, are apparently as good as new, and have thus far required no repairs. This automatic weighing and registering of the amount of coal delivered by the barge is a matter of considerable importance to steamship owners. By the ordinary methods of obtaining coal they must accept the weights given by the coal operators, and they have no satisfactory check upon the accuracy of these weights.

After the coal leaves the scales it slides down the telescopic chutes into the bunkers, where it is taken care of in the usual manner by the trimmers. By the use of a flexible end to the chute it is easy to carry the coal into any corner of the bunker, and thus greatly diminish the trimmers' labor.

The whole crew of the barge consists of six men—the captain, who handles from the deck the levers operating all the machinery; the engineer and fireman; a man at the overhead winch to handle the chutes; a man to oversee the filling of the bunkers; a man in the scale house, who acts as a lookout, and the cook.

The work done with the barge during the past year has been largely educational, coaling many individual steamers belonging to different lines, so as to get vessel owners and agents acquainted with it. It is the intention to take the barge to Philadelphia, Baltimore, and other points, to show by practical demonstration what it can do. A new company is being organized for the purpose of regularly handling coal in New York harbor. It will have its own coal docks where it will receive coal by rail, and a fleet of barges, so that there will be no delay in coaling vessels immediately upon their arrival in port.

Offices of the Automatic Coaling & Weighing Barge Co. are at No. 29 Broadway, New York city, and the general manager is Mr. P. B. Clarke, the patentee of the mechanical devices used in the barge.

WITH THE COAST SHIP BUILDERS.

A four-masted barge named Sagua, a duplicate of the Havana, Matanzas and Cardenas, was launched last week from Kelley, Spear & Co.'s yard, Bath, Me. She is the last of the quartet contracted for by the Staples Coal Co., Taunton, Mass., and will be used in the coal carrying trade to Cuba. She is 249 ft. long, 43 ft. wide and 19 ft. deep. She is the 108th vessel to be launched by Kelley, Spear & Co. This firm is also building a four-masted schooner for F. J. Hinckley.

Tarr & James, Essex, Mass., launched the schooner Corona, built for Cunningham & Thompson of Gloucester, Mass., a few days ago. The vessel's dimensions are: Length, 100 ft.; width, 24.9 ft.; depth, 10.2 ft. A vessel of practically the same dimensions will be built for Capt. Harry Gardner of Gloucester, Mass. Two new schooners building in this yard for David B. Smith & Co. are nearly finished.

The Lake Torpedo Boat Co. filed articles of incorporation at Elizabeth, N. J., last week. The company is capitalized at $1,000,000, and the incorporators are Lebbeus B. Miller, superintendent of the Singer Sewing Machine Co., Elizabethport; Simon Lake of Bridgeport, Conn., and J. Christopher Lake of Rutherford. The object of the company is to build ships and submarine boats of all kinds.

The Harlan & Hollingsworth Co., Wilmington, Del., launched last week the ferryboat Cape May, to be added to the Reading Railway fleet. The work on the steamship Denver, building at these yards for the Mallory line, is nearing completion, and in a short time the vessel will be given a trial on the Delaware. The steamer San Marcos of the same line is undergoing a thorough overhauling.

The Burlee Dry Dock Co., Port Richmond, S. I., is constructing a large steam lighter (No. 4) for the New York Central Ry. The vessel's dimensions are: Length, 110 ft., beam 30 ft., and depth 11 ft. 6 in. This company is also building the light-house tenders Larkspur and Sumac, the latter being for service on the great lakes.

A four-masted wooden schooner, the Inez N. Carver, was launched last week from the New England Ship Building Co.'s yard, Bath, Me. The vessel measures 167.6 ft. in length, 36 ft. in width and 13.4 ft. in depth. The schooner is fitted with a Hyde windlass outfit—engine, windlass and wrecking pumps and steam winch on the forecastle.

The Burlee Dry Dock Co., Port Richmond, S. I., is building a steam yacht for W. B. Leeds. The yacht is to be 260 ft. over all, 215 ft. on the water line, 28 ft.beam and 14 ft. draught. She will have twin-screws and be able to steam 15 knots an hour. She is expected to make long voyages and will have large coal carrying capacity.

The Philadelphia & Bordentown Transportation Co. has given a contract to the Pusey & Jones Co., Wilmington, Del., for the construction of a screw steamboat for use in the upper waters of the Delaware river between Philadelphia and Bordentown.

Work is progressing at the yard of the New England Ship Building Co., Bath, Me., upon a five-masted schooner building for W. F. Palmer of Boston. She will be 206 ft. long, 46 ft. keel and 27 ft. deep.

Percy & Small, Bath, Me., will launch in about six weeks a four-masted schooner for J. S. Winslow & Co. The five-master which this firm is building for Capt. Haskell of Boston is framed out.

A. S. Bigelow of Boston, owner of the steam yacht Ituna, has ordered a large steel steam yacht from the Bath Iron Works, Bath, Me.

Arthur Sewall & Co., Bath, Me., will lay the keel next week for the steel ship Atlas, to be built for the Standard Oil Co.

TRADE NOTES.

Hall Bros., Bourse building, Philadelphia, are developing a very large business in gas engines and high-grade launches. They keep boats and engines in stock ready for immediate delivery. Their basis of success is the Hall gasoline engine, which has been found to be especially adapted to launches. They have special designs of ignitors and vaporizers, and announce that in the matter of repairs to gas engines of any kind they will send an expert on short notice to any part of the United States.

The cover of the latest catalogue of the Standard Pneumatic Tool Co. of Chicago, done in a very dark green, displays a picture of a little giant holding aloft two pneumatic tools, and aptly illustrating their "Little Giant" variety of tool. The catalogue illustrates every kind of tool made by this company. It has numberless illustrations, showing the tools in actual use in boiler shops and ship yards, machine shops and bridge works. For boring and riveting there is nothing equal to a pneumatic tool. The catalogue contains sixty-five pages and is finely printed.

John Napier Dyer, 1425 Monadnock block, Chicago, has been appointed agent in that city for the Falls Hollow Staybolt Co. of Cuyahoga Falls, O., and Thomas J. Noonan, 923 Guaranty building, Minneapolis, has been appointed northwestern agent for the same company. The Falls company announces that owing to recent improved facilities, installed for the manufacture of both hollow and solid staybolt iron, they are not only able to produce a superior article of refined charcoal iron, or No. 1 steel staybolts, but are in position now to quote the lowest possible prices on this high-grade material. Samples are furnished on application.

The vessel business is closely allied with iron mining and lumber interests, and this is probably why the chain specialties of the Newhall Chain Forge & Iron Co. (offices in the Havemeyer building, New York), may be of special interest to readers of the Review. They make high class yacht and ship cables; hand-made crane, quarry, mining, rafting, toggle, log, haul-up and conveyor chains; also high grade brake special steel loading and skidding chains. A letter from the company says that the forge shops are putting in fifteen hours a day on the manufacture of scow forgings, shackles, swiffles, davits, timber dogs and other small forgings. In the chain shops they are now working on several orders for stud link anchor chains for large schooners building throughout the country, and also on a large number of orders for their branded "Warwick" steam shovel chains for ore mining companies in the Lake Superior region. Several orders for "Warwick" dredging chains for dredging concerns on the great lakes are also under way.

"Coal Handling" is the title of a booklet issued by the Robins Conveying Belt Co., Park Row building, New York. Everyone interested in coal conveying should write for a copy of this little work as it is certainly most instructive. At the Paris exposition in 1900 the Robins belt conveyors received the only grand prize awarded for conveying machinery. It was not until 1897 that this company installed its first conveyor for carrying coal. Today its conveyors in use have an aggregate capacity of 122,000 tons. The fundamental principle of the belt conveyor is the perfect separation of the conveying parts from the running parts. The coal is received directly on the troughed belt and carried at a minimum of friction to its destination. The Robins system has but two component parts—a rubber belt and fixed set of pulleys. The coal never comes in contact with the pulleys to retard or clog their action. The photographs reproduced in the catalogue show the adaptability of the system to almost every phase of the mining, shipping and storing of coal.

Rarely has the Review had the privilege of inspecting so exquisite a catalogue as that lately issued by the Brown Hoisting Machinery Co. of Cleveland. The frontispiece shows the main office and works of the company as they will be when completely reconstructed. Surprising energy has been displayed in erecting the new buildings since the fire. In the introduction the company says that it does not build cheap cranes in any sense of the word, but strictly high-class ones, combining every modern improvement, approved safety devices and best design. The company says that with the Western Patent safety lowering device, which it owns exclusively, it is impossible to drop a suspended load whether through "use, misuse, carelessness or neglect," or in the case of its hand-operated cranes to injure a workman by flying handles in lowering a load. The company is today receiving orders for cranes from all parts of the world. Extended descriptions are given of the locomotive crane, steam wrecking crane, electric traveling crane, electric balanced, cantilever ship building crane and all other cranes made by the company. The catalogue is bound in cloth and is superbly illustrated with half tones throughout.

The Steam Boiler Equipment Co.'s system of saving coal and at the same time greatly improving the efficiency of boilers, has several times been referred to in these columns on account of very favorable reports regarding it from steam users, both in stationary and marine lines. The apparatus, which was only recently introduced in the west, is being tried on one of the Chicago harbor tugs. On the Atlantic seaboard its use is so extensive that the company controlling the patents is hard pressed to keep up with orders. Messrs. Stuart & McCurdy, Philadelphia agents for the company (Drexel building), are just in receipt of the following letter from one of the very conservative ship building concerns of the east, the Neafie & Levy Ship & Engine Building Co. of Philadelphia: "In answer to your verbal inquiry regarding the efficiency of your system on our two boilers, we wish to state that before we placed your appliance on our boilers we could only obtain from 65 to 90 lbs. of steam, depending upon the quality of coal and weather. With your apparatus we can easily keep up 100 lbs. of steam, under all conditions, and often more. For about thirty days before you connected your system to our boilers we weighed all our coal, and also weighed it for about two months after the system was connected, and if we are not mistaken in our calculations there is also a saving in the coal and the system is working with entire satisfaction."

SCENE OF ARMOR PLATE CONTROVERSY SHIFTS.

The seat of the armor plate controversy has shifted from the United States to Germany. The same old bugaboo, a government armor plate factory, was sprung upon the Germans in the hope of causing the Krupps to reduce their prices. The Review pointed out at the time that congress was protesting against the figures asked by Carnegie and the Bethelehem company that they were considerably lower than the figures exacted in Germany. The United States has, in point of fact, been getting its armor plate at extremely low figures in comparison with what European companies have paid for it. The following article, from one of the European technical journals, reviews the situation in Germany at present:

"The question as to the manufacture of armor plates has again been raised in Germany, in consequence of the circulation of reports relating to the intentions of the government in regard to the matter. It may be remembered that a few months ago, when considering the navy estimates for the current financial year, a resolution was adopted by the Reichstag expressing the opinion that the government should establish state works for the production of armor plates, with the object of economizing the national expenditure on this item of construction in connection with the large scheme for increasing the German navy. It is now reported by some of the German papers that the government does not propose to erect such works, and, it is added, that armor plates can at present be obtained from Messrs. Krupp—who, with the Dillingen works of the late Baron von Stumm, have a monopoly of this trade in that country—at cheaper prices seeing that the adoption of the navy extension programme has enabled the government to conclude contracts on a large scale, whereas in former years it was only possible to buy in detail, that is, in small quantities. The statements made to this effect have apparently aroused the ire of the Cologne Volkszeitung, which points out that the latest naval scheme was adopted over a year ago, and that there are no essential alterations in the requirements in the matter of armor plates for 1901, and subsequent years, in comparison with 1898, 1899 and 1900. The assertion that it is now possible for the government to enter into large contracts is characterized as quite incorrect, as everything is subject to annual sanction through the budget. It is, however, obvious from the reports that the authorities of the admiralty do not intend to give effect to the resolution of the Reichstag in favor of the establishment of a government armor plate manufactory, the reason adduced being that no reduction in the price would be obtained by production under state auspices. The Cologne paper submits that this is an extremely naive explanation, as the persons in authority should know full well that the cost to the manufacturers of armor plates hitherto sold at £116 per ton only amounts to from £48 to £50, and that even if a reduction has now been made to £96 per ton the makers still receive a profit of 100 per cent. Do the naval authorities, the paper continues, really believe that they would under all circumstances be compelled to produce armor plates in government works at a price 100 per cent. higher than the cost incurred by the present makers? In this connection it may be mentioned that some time ago a Rhenish syndicate expressed its readiness to commence the delivery in 1903 of nickel steel armor plates of the same quality as those now used at the rate of £77 10s. per ton, or £38 10s. per ton less than the price hitherto paid, provided that the government would undertake to give it a fair share of the orders for armor plates. This offer appears to have come to the knowledge of the present contractors, who have agreed to reduce the price to £96 on the assurance that the government would obtain all its supplies from them until the year 1907. As far as purchases in detail are concerned, the Cologne organ mentions that during the years 1898, 1899, and 1900, the deliveries of armor plate to the admiralty amounted to from 16,000 tons to 18,000 tons, at a price of about £1,850,000 to £2,050,000, leaving a profit to the manufacturers ranging from £1,000,000 to £1,150,000. It is, of course, highly questionable whether the profits amount to anything like the extent cited by the Cologne paper in case of a specialized industry such as that of manufacturing armor plates, where a large capital expenditure is required for the purpose of equipment with complete modern machinery, the value of which has to be written down considerably every year, in view of the prospective improvements in the manufacture which may possibly cause plant that is up-to-date at the present time to become antiquated in from five to ten years. At the same time, the fact is interesting that a Rhenish syndicate has expressed its readiness to supply armor plates at £77 10s. per ton by the year 1903, although no government would be disposed to commit itself to delay in delivery by awaiting the pleasure of a new undertaking to start an industry of which it has had no previous experience. The name of the Rhenish syndicate does not appear to have been disclosed, but a Hoerde correspondent now states that the well-known Hoerde Verein has announced that it is prepared to supply large quantities of nickel steel armor plates. Whether these two are identical is a matter for conjecture, but there is no doubt that the manufacture of armor plates is engaging a larger share of attention in Germany at the present time."

The Cunarder Lucania, from Liverpool and Queenstown, experimented with the Marconi system of wireless telegraphy on her last voyage to New York. Going down the Mersey she exchanged aerial greetings with the British schoolship Conway, which is equipped with the Marconi apparatus. She also swapped salutes with wireless telegraph stations on the Irish coast, and while at sea exchanged sentiments with the Elder-Dempster liner Lake Champlain, also fitted with a wireless system of communication. Many passengers sent messages to their friends ashore by way of stations on the Irish coast.

New train east via B. & O. R. R.—Leaves Cleveland 11:20 p. m. daily with through sleeper to Pittsburg and observation chair cars to Washington, Baltimore, Philadelphia and New York, giving daylight ride through the mountain scenery. June 30.

A new chart, in colors, of Erie harbor and Presque Isle, has just been issued and may be had from the Marine Review. A new chart of Buffalo harbor and Niagara river to the falls is also in print.

OVAL EDGE STAR BRONZE YACHT BLOCK.

From an advance proof of a catalogue supplement issued by the Boston & Lockport Block Co., manufacturers of tackle blocks, we take the two illustrations appearing herewith. The block is what is known as the oval edge star bronze yacht block, and was only recently placed on the market. The block is unusually light and strong, all parts are of bronze and the construction and operation of the sheave are quite novel. Special claims are made for it as regards economy of rope and easy operation. The metal is made from a special formula, which has been put to a thorough test at the Watertown arsenal, with satisfactory results. The shells are made both open and solid, and there are all kinds of attachments necessary for the rigging of small yachts. The appearance of the block is decidedly in its favor. The Boston & Lockport Block Co., manufactures all kinds of tackle blocks. Special types of cargo hoisting blocks are of late design. The main offices of the company are at No. 142 Commercial street, Boston.

At the annual meeting of the Dominion Iron & Steel Co., held in Montreal last week, officers and directors were elected as follows: H. M. Whitney, president; A. J. Moxham, vice president and general manager; directors, Sir W. C. Van Norne, R. B. Angus, James Ross, Hon. George A. Cox, Elias Rogers, Hon. Robert Mackay, H. F. Dimock, A. H. Paget, David Mackeen, W. B. Ross, B. F. Pearson, J. S. McLennan, A. J. Moxham, H. M. Whitney and F. S. Pearson.

REFRIGERATION OF SHIPS.

We are informed that the Canadian government is arranging with several shipping companies to install mechanical refrigerating plants on their different steamers, which, besides cooling the air, purifies it, as it has been found that to keep in the best of condition goods that require refrigeration it is necessary to have pure air. Contracts have already been entered into and the results will be watched with unusual interest. The cooling and purifying of the air is done on entirely new methods of the American Linde Refrigerating Co., which thus far have proven highly satisfactory, and if results during the present summer turn out as anticipated it is more than probable that an entire change from the present practice in refrigeration on board ships will follow.

Mr. F. H. Clergue, who is conducting large industrial enterprises on Lake Superior, recently visited Collingwood, Ont., one of the principal Canadian ports on the great lakes, and was given a great reception by the citizens. He made the prediction that Collingwood was destined to occupy the same position relatively to the Canadian northwest that Chicago and Buffalo do to the United States. Collingwood, when the Manitoulin & North Shore Railway is completed, will have, he said, twelve months' season instead of eight as at present. Immediately following the completion of the Algoma Central & Hudson Bay Railway a passenger will be able to go aboard a sleeper at Collingwood and in one day and two nights he will be landed on the shore of the Arctic ocean. Mr. Clergue was pleased at the progress made by the Collingwood ship yard and said that if his board of directors agreed with him he would be glad to give the company the contract for the first two barges he required.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., June 26, 1901. Sealed proposals for Repair of Piers at Manistee, Mich., will be received here until 3 p. m., July 26, 1901, and then publicly opened. Information furnished on application. Charles Keller, Capt., Engrs. July 18.

ON THE SUBJECT OF AIR COMPRESSORS.

A very tasty catalogue in gray and silver has been issued by the New York & Franklin Air Compressor Cos. The sales offices are at No. 95 Liberty street, New York, and the works at Franklin, Pa. An excellent wash drawing is given of the works at Franklin, Pa. The company says in its introduction:

"In the selection of an air compressor it is unwise to consider immediate needs only, for the introduction of compressed air in any establishment is invariably followed by utilizations of it not originally intended. Good practice suggests installing a compressor possessing a sufficient margin of reserve capacity to meet the additional demands that are sure to follow. The duplex type of compressor permits the purchase of one half at first and the addition of the other half when the further capacity is needed. After the required volume and pressure of air has been determined the next consideration is to fix upon the size, type and make of compressor to be selected, and therein lies one of the most important features of the problem. A too-frequent error is to regard low first cost as the primary consideration. The air compressor that is cheap in first cost invariably proves more expensive in the end through greater power consumption and frequency of repairs. The lists of air compressor manufacturers rate the free air capacity theoretically; in other words, the area of the cylinder is multiplied by the rate of piston speed, without allowance for the unavoidable losses in air compression due to heat, friction and clearance. The percentage of loss chargeable to these causes is naturally directly dependent upon the efficiency of the air compressor, suggesting the inevitable conclusion that the difference in first cost when invested in the most economical compressor earns a handsome interest through the saving effected in reduced power consumption and general operating expenses. The comparative economy of air compressors is not as frequently investigated and determined as it should be. In a water pump or steam engine, decreased efficiency becomes readily discernible, but the deficiencies of an air compressor are not as promptly brought to view. Compressed air, if one would realize all the commercial economies and benefits that accrue, should be produced with the best machinery obtainable and utilized with the most improved equipment and appliances. For similar reasons a second-hand air compressor, unless first repaired by a reliable maker, is rarely a wise purchase. Under any circumstances the suitability of a second-hand air compressor for the service intended should be carefully considered, especially as to its proper proportionment for the air pressure required, and (if steam driven) the steam pressure available. The desirability of installing an air compressor, operated directly by steam, or by belt, electric or other power, naturally depends upon individual conditions which should be stated in as complete detail as possible when requesting quotations."

The company gives a general description in its catalogue of all the air compressors which it makes. It will be sent to those interested on application.

A number of very complete outfits of driving machinery and boat equipment, accompanied by plans and specifications for building the hull and installing the machinery, have been sent out by the Marine Iron Works, station A, Chicago. Several similar contracts now under way. This is a plan that they have demonstrated to be an exceptionally good one, particularly for those located at a distance where they may have suitable material and good men to do the work, provided they secured the necessary information with plans and details, all of which the Marine Iron Works furnish with their complete machinery outfits when so contracted for. 3

For navigation charts apply to the Marine Review.

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Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Seidler-Miner Electric Co.....Detroit.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC HOISTS AND CRANES.

Bullock Electric Mnfg. Co.....Cincinnati.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lake Shore Engine Works.....Marquette, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Olds Motor Works.....Detroit.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
Seidler-Miner Electric Co.....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane & Co.....Chicago.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Gaskin, Edward.....Buffalo.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Wood, W. J.....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James.....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Reynolds, H. J.....Cleveland.

FIRE EXTINGUISHING APPARATUS.

Clayton Fire Extinguishing & Disinfecting Co.New York.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

FOG SIGNALS.

Colt Co., J. B.....New York.
Hamilton-Foster Fog Signal Co.....New York.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FORGINGS.

Bourne-Fuller Co.....Cleveland.
Cleveland City Forge & Iron Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas).....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Ohio Fuel Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Scott Co., The W. L.....Erie, Pa.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Lake Shore Engine Works.....Marquette, Mich.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.
Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, STEAM.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HATCH GEARS.
"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Incorporated..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.
Sayen & Schultz.....Philadelphia.

HYDRAULIC MACHINERY.
Bement, Miles & Co.....Philadelphia.
Watson-Stillman Co., The.....New York.
Wood & Co., R. D.....Philadelphia.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

IGNITERS FOR GAS ENGINES.
Holtzer-Cabot Electric Co.....Brookline, Mass.

INJECTORS.
Crane Co.....Chicago.
Jenkins Bros.....New York.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn, F. H. & Co.....Chicago.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

LAUNCHES—NAPHTHA, ELECTRIC.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

LOGS.
Walker & Son, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MACHINE TOOLS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.
N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Boston Blower Co.....Hyde Park, Mass.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.
Paul & Co., J. C.....Chicago.

MILLING MACHINES OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.
Merrell Mnfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Mott Iron Works, J. L.....New York.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.
Paul & Co., J. C.....Chicago.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

PROJECTORS, ELECTRIC.
Bullock Electric Mnfg. Co.....Cincinnati.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.
Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Dominion Line .....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
American Bridge Co.....New York.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

SURVEYORS, MARINE.
Gaskin, Edward .....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

TOPOPHONE—Prevents disasters in fogs.
Colt Co. J. B.....New York.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.
D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

WANTED, FOR SALE, FOR CHARTER, Etc.

Space under this heading 25 cents a line, each insertion, for three insertions or less. Special rates for periods of more than three insertions.

—FOR SALE—Passenger steamer Hattie, capacity 250 passengers, 100 tons of freight. John Stevenson, Detroit, Mich. July 11

—FOR SALE—Fast and powerful steam launch. Suitable for pleasure, cruising or short trade. Fitted with cabin, pantry, closet, etc.; Roberts water tube boiler, allowed 200 lbs. steam; compound engines, 6 and 12x6; 36-in. propeller wheel; oak hull; good as new; inspection guaranteed; a bargain. H. Myers, P. O. Box 162, Covington, Ky. d

—FOR SALE—New locomotive fire-box boiler. Fire-box 84½ in. long, 89 in. high, 64 in. wide. Contains 237 2¼ in. by 17 ft. iron tubes. Steam drum 36 in. diameter, 11 ft. long. Working pressure, 200 lbs. The S. Freeman & Sons Mn'fg. Co., Racine, Wis. tf.

—FOR SALE—Balanced compound marine engines, 20 to 200 H.P. Immediate delivery. Patterns for larger sizes and for quadruple expansion engines. Wells Engineering Co., 136 Liberty street, New York City. July. 25.

—WANTED—Agents to call on all consumers of polishes, particularly yachts, steamers, etc. Bertram's Oil Polish Co., Boston, Mass. tf

—FOR SALE—Complete plant for steel ship building. P. O. Box 23, Perth Amboy, N. J.

—FOR SALE—Harbor tugs Owen and Delta. Engines 20x20 and 20 x22 in., respectively. Good boats. Cheap for cash. Ranney Bros., 65 Merwin St., Cleveland. tf.

—FOR SALE—Scott's Coast Pilot, 1901 edition. Great lakes and connecting waters. Fully revised. Price, $1.50. The Marine Review Pub. Co., Cleveland. tf

—FOR SALE—Charts of all the world. Charts of the great lakes always in stock. United States Hydrographic Office charts, Coast Survey charts, Army Engineer charts. We bind charts and back them with tape, so that they will last for years. The Marine Review Pub. Co., Cleveland. tf

MARINE REVIEW

VOL. XXIII. CLEVELAND, O., JUNE 27, 1901. No. 26

THE BROWN HOISTING MACHINERY CO. INCORPORATED

Engineers, Designers and **Manufacturers** of special machinery for hoisting, conveying, storing and handling material of all kinds under the well-known **"Brownhoist"** patents.

BRIDGE UNLOADERS
for rapidly discharging bulk cargoes from vessels directly to cars or to storage on docks.

FAST PLANT UNLOADERS
for rapidly handling either bulk or package freight.

CRANES
of every description for every kind of service.

Main Office and Works, CLEVELAND, O., U. S. A.

Eastern Office, 26 Cortlandt St., New York City. Pittsburg Office, Carnegie Building, Pittsburg, Pa. European Office, 39 Victoria St., London, S. W.

GENERATORS — ELWELL-PARKER ELECTRIC CO. OF AMERICA MANUFACTURERS GUARANTEES QUALITY CLEVELAND, OHIO. — MOTORS

STANDARD MARINE GENERATING SETS. COMPLETE HOISTING AND POWER PLANTS.

AMERICAN SHIP WINDLASS CO.,

P. O. Box 53, **PROVIDENCE, R. I.**

Send for Catalogue. Address FRANK S. MANTON, Agent.

Ship Machinery.

Sole Builders of the **ORIGINAL and ONLY AUTOMATIC STEAM TOWING MACHINE.**

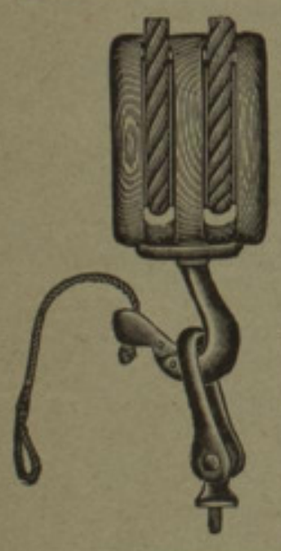
WILLIAM L. BROWN, President. B. W. WELLS, Vice-President. O. R. SINCLAIR, Sec'y and Treas. JOHN A. UBSDELL, Jr., Genl. Mngr.

CHICAGO SHIP BUILDING COMPANY,

Long Distance Telephones.
Ship Yard and Dry Dock Office, "South Chicago 40."
Chicago Office, 1125 Rookery, "Harrison" 1207.

STEEL SHIP BUILDERS AND DRY DOCK PROPRIETORS.

Dry Dock and Yards: 101st St. and Calumet River, CHICAGO, ILL.



Standard Automatic Releasing Device.

THE FALLS ARE SO ROVE THAT BOTH ENDS OF THE BOAT DETACH, IRRESPECTIVE OF WHICH END STRIKES THE WATER FIRST.

Will release a boat immediately in the roughest sea or under speed and can be hooked on without delay or injury to the hands of men hooking it on.

Standard Automatic Releasing Hook Co.,
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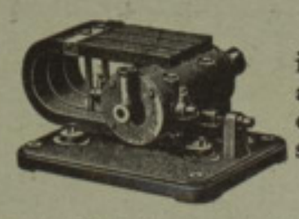

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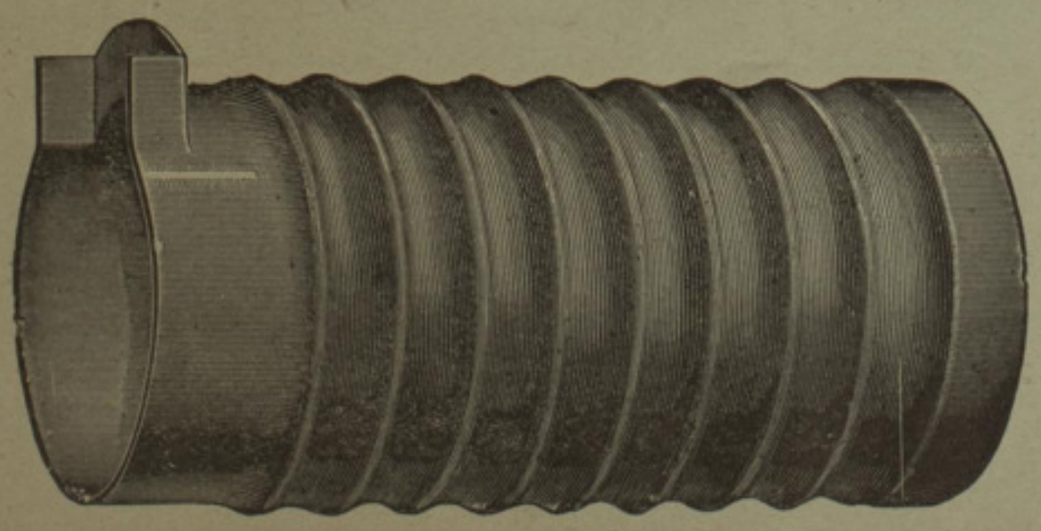

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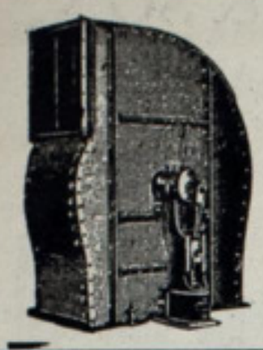

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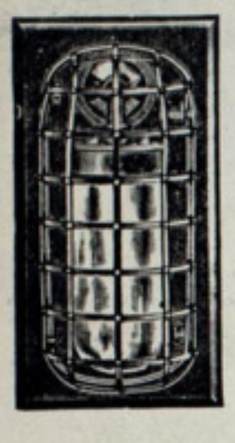

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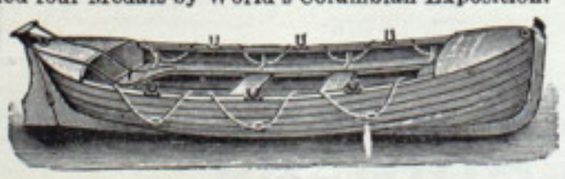

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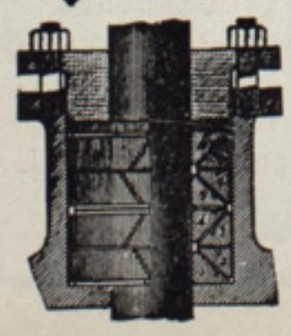

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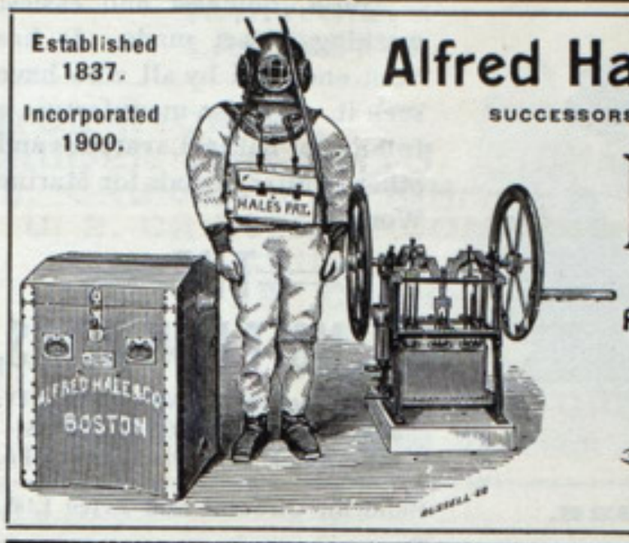

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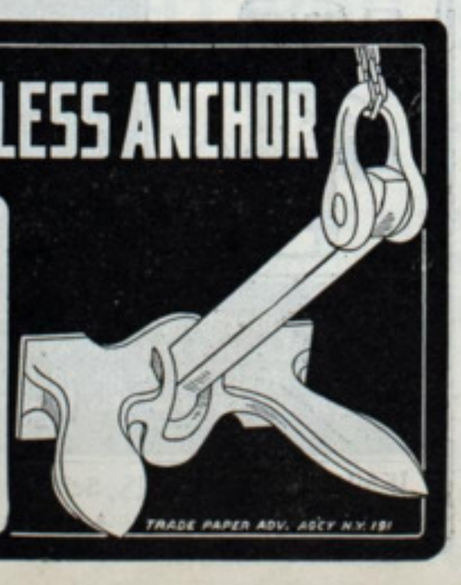

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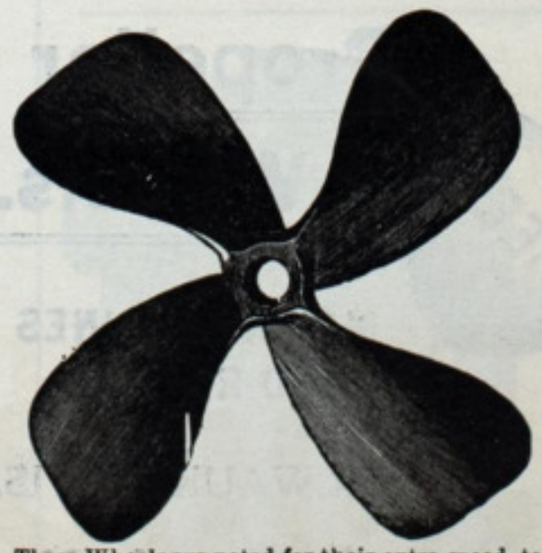

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